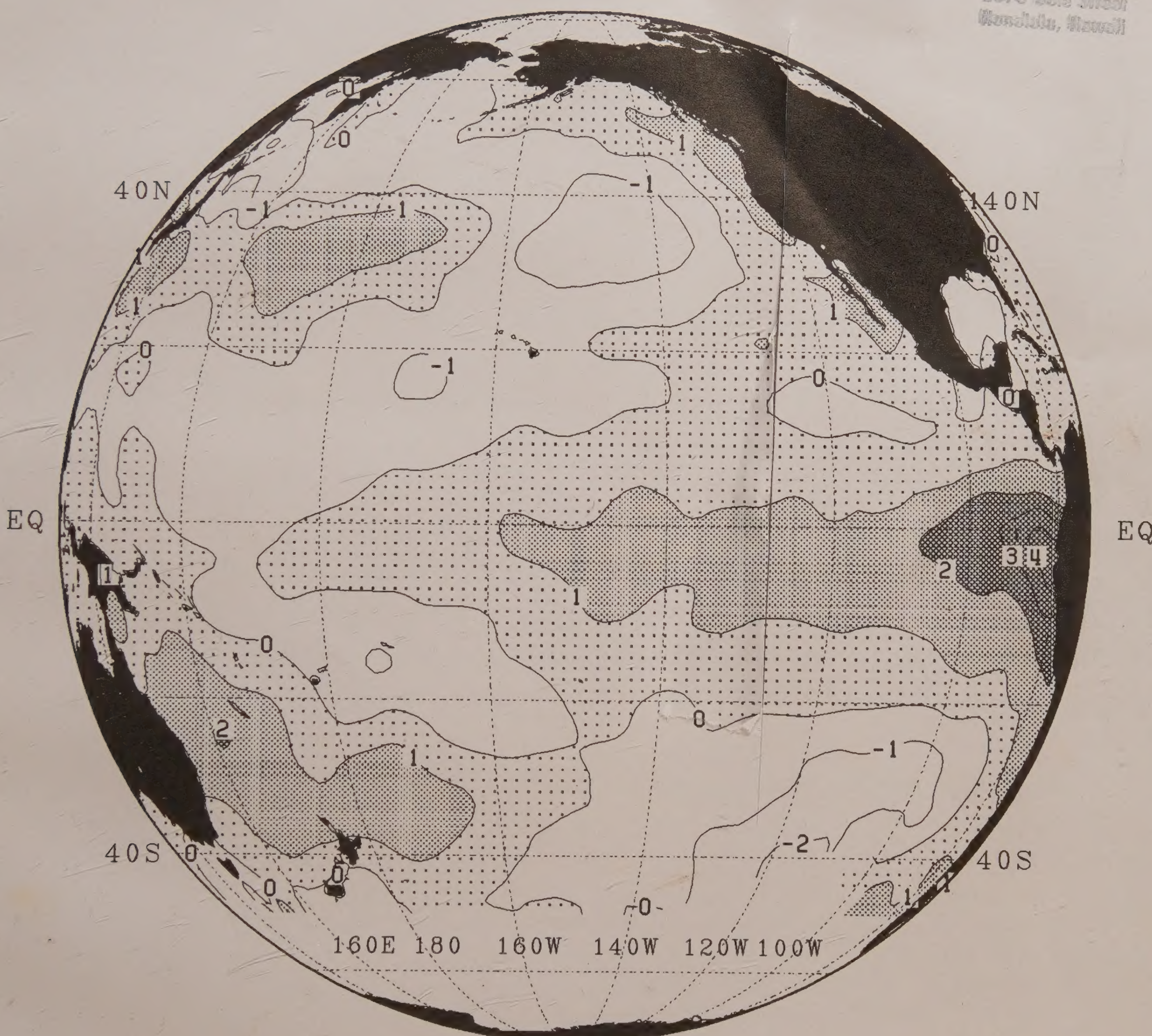
気象庁海洋月報

Monthly Ocean Report

May 1998 (No. 65)



Climate and Marine Department
Japan Meteorological Agency

気象庁 気候・海洋気象部

平成１０年５月

気象庁海洋月報は、気象庁 気候·海洋気象部 海洋課で作成しています。
本月報に関する問い合わせは、

〒100-8122　東京都千代田区大手町1-3-4　気象庁 気候·海洋気象部 海洋課まで。
電　話 (03) 3212-8341 (内線 5128、5129)
ＦＡＸ (03) 3211-3047
電子メール ocean@hq.kishou.go.jp

Monthly Ocean Report is prepared by the Oceanographical Division, Climate and Marine Department, Japan Meteorological Agency.

Correspondence relating to this report may be directed to :

Tokunosuke Fujitani
Director, Oceanographical Division
Climate and Marine Department, Japan Meteorological Agency
1-3-4 Ote-machi, Chiyoda-ku, Tokyo 100-8122 Japan
Facsimile: +81-3-3211-3047
e-mail : ocean@hq.kishou.go.jp

表紙は、1998年5月の太平洋の月平均海面水温偏差図です。
陰影部は、平年より高温の海域を示しています。

The figure on the front cover shows the monthly mean SST anomalies for May 1998 in the Pacific Ocean.
Areas of positive anomalies are shaded.

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海況の特徴（１９９８年５月）

日本近海の海況

海面水温は，本州の南及び日本海西部で平年より１℃以上高く，日本海北部及び北海道の東から三陸沖にかけて平年より0.5℃以上低かった（第4図）。

黒潮は，九州の東で離岸して北東に流れた後，上旬には室戸岬から紀伊半島にかけて，中旬には紀伊半島にそれぞれ接岸していたが，下旬には紀伊水道沖で小蛇行が見られ熊野灘で接岸する流路となった。紀伊半島から東では，黒潮は三宅島と八丈島の間を経て，房総半島沖を北東から東に流れていた（第9図）。

親潮系の冷水の沿岸寄りの分枝は38.6°N,143.0°Eまで,沖合の分枝は38.6°N，145.5°Eまで，それぞれ達していた（第5図）。

太平洋の海況

太平洋赤道域の海面水温は，160°W以東で平年より１℃以上高く，南米沿岸では＋3℃以上の正偏差が見られた。エルニーニョ監視海域（4°N～4°S，150°W～90°W)の海面水温偏差は,1997年11月以降減少し続け＋1.7℃となった(表1)。

北太平洋では,40°N～50°Nの160°E以西,及び30°N～45°Nの160°W～135°Wでは平年より１℃以上低かった。30°Nに沿った160°E～170°Wは＋1℃以上の正偏差となった。北米沿岸は依然として＋1℃以上の正偏差が見られた（第16図）。

Highlights May 1998

Seas adjacent to Japan

SST anomalies exceeding +1°C were found south of Honshu and in the western Japan Sea. SSTs were more than 0.5°C below normal in the northern Japan Sea, east of Hokkaido and off Sanriku (Fig. 4).

The Kuroshio flowed northeastward off Kyushu, then along Muroto Misaki and the Kii Peninsula in the first 10-days of the month, and flowed close to the Kii Peninsula in the second 10-days. The Kuroshio meandered off the Kii Channel, then approached the east coast of the Kii Peninsula in the last 10-days. South of Tokai, it flowed eastward, passing between Miyake and Hachijo Islands through the month, and flowed northeastward or eastward off the Boso Peninsula (Fig. 9).

Coastal and off-coastal branches of the Oyashio cold water extended southward to 38.6°N, 143.0°E and 38.6°N, 145.5°E, respectively (Fig. 5).

Pacific Ocean

In the equatorial Pacific, SSTs were more than 1°C above normal east of 160°W. SST anomalies exceeding +3°C were observed near the South American coast. The SST anomaly of the El Niño monitoring region (4°N-4°S, 150°W-90°W) has decreased steadily since November 1997, and was +1.7°C in May (Table 1).

In the North Pacific, SST anomalies exceeding -1°C were found west of 160°E between 40°N and 50°N, and from 160°W to 135°W between 30°N and 45°N. Positive SST anomalies exceeding +1°C were observed along 30°N from 160°E to 170°W. Along the North American coast, SST anomalies remained above +1°C during May (Fig. 16).

日本海固有水の長期変動について－その２.溶在酸素量

Long-term Variation of the Japan Sea Proper Water － Part 2. Dissolved Oxygen

舞鶴海洋気象台の観測船「清風丸」は，年４～５回定期的に日本海の観測を行っている。1972 年から 1996 年までの観測データを使って，観測点 P（図 A）における日本海固有水の溶在酸素量の長期変動を調べた。

日本海の深層水循環は海底地形によって、その水平循環が制限されている。このため，水平循環が卓越する太平洋などに比べると相対的に鉛直循環が活発である。海面冷却に伴って生成される日本海固有水は滞留期間が短く，溶在酸素量も高い。

点 P における 1200 m 深と 2500 m 深の溶在酸素量を，1972 年からの時系列(図 B)で示す。いずれも統計的に有意な長期減少トレンドがあり，25 年間の減少量は 1200m 深で 5.4 μ mol/l，2500m 深で 15.7 μ mol/l であった。これは，日本海における海面からの高酸素水補給の減少を示唆している。

The R/V Seifu Maru of the Maizuru Marine Observatory/JMA has been observing oceanographical conditions periodically in the Japan Sea several times a year. Long-term variation of dissolved oxygen within the Japan Sea Proper Water (JSPW) is analyzed by using the data from 1972 to 1996 at the Station P (Fig. A).

As the horizontal deep-water circulation is topographically restricted within the Japan Sea, the residual time of JSPW is higher than that of the North Pacific Deep Water (NPDW). Therefore the concentration of dissolved oxygen in JSPW is also higher than that of NPDW.

Time series of the concentration of dissolved oxygen at the depths of 1200 m and 2500 m are shown in Fig. B. The descents are statistically significant and the decreases for 25 years are 5.4 μ mol/l and 15.7 μ mol/l, at 1200 m and 2500 m depths, respectively. It is suggested that the supply of the surface water with high oxygen concentration is decreasing in the Japan Sea.

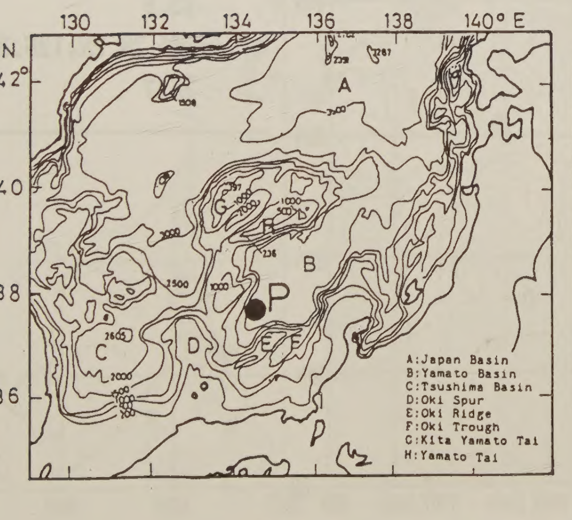


図 A. 日本海の海底地形図及び観測点 P の位置

Fig.A. Bottom topography in the Japan Sea, and the location of the Station P.

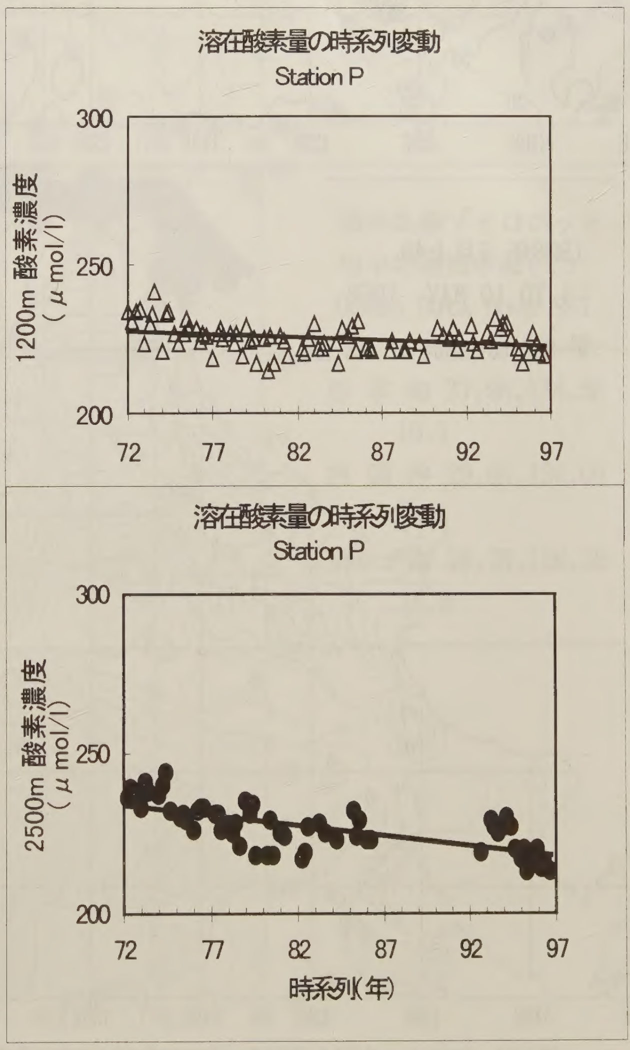
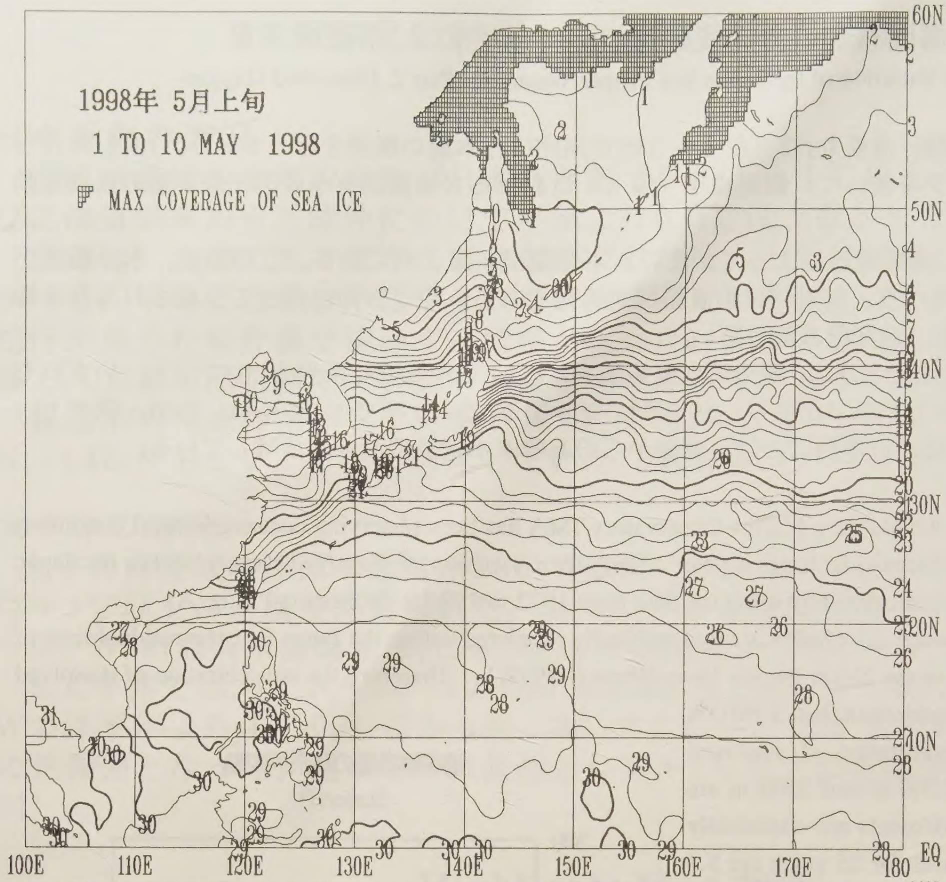


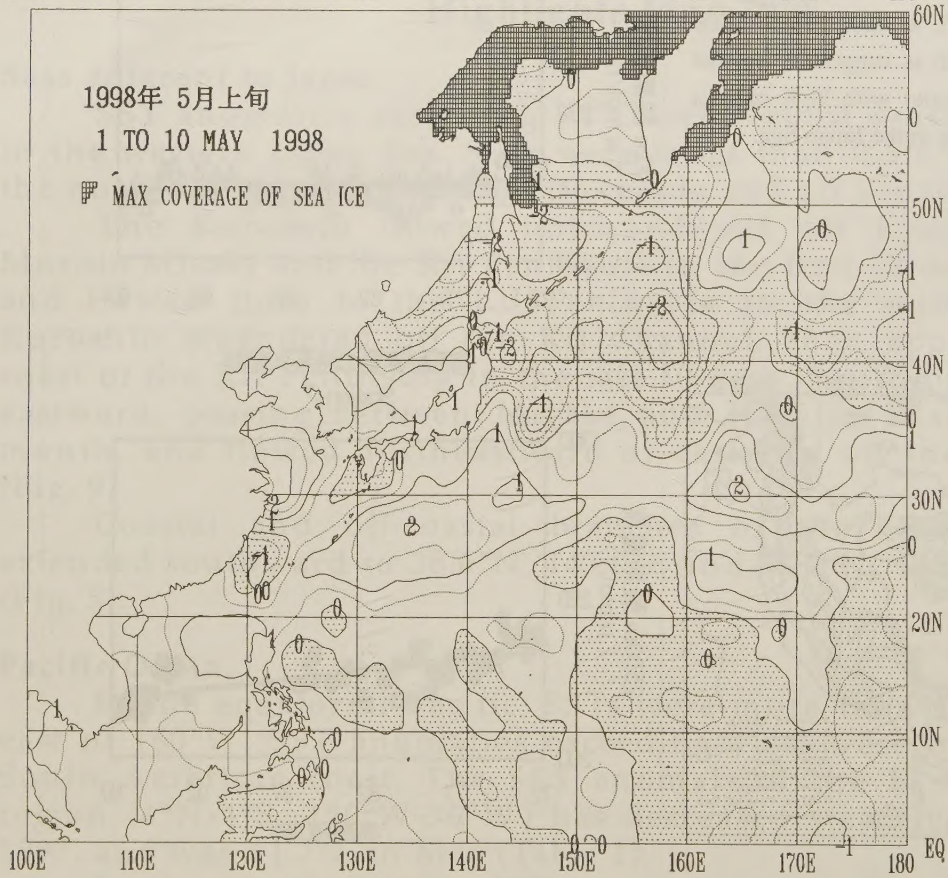
図 B. 観測点Ｐにおける日本海固有水内の 1200 m (上), 2500 m (下)深の溶在酸素量の時系列図

Fig. B. Time series of dissolved oxygen at the depths of 1200 m (upper) and 2500 m (lower) at Station P.



旬平均沿岸水温(℃)
Coastal Water Temperature

地点名 (Index Number)	水温 Temp.	偏差 Anom.
石　垣(47918)	26.8	1.2
御前崎(47655)	19.0	1.5
八丈島(47678)	23.4	3.6
小名浜(47598)	10.6	-1.4
宮　古(47585)	9.6	1.4
江　差(47428)	11.5	-
浜　田(47755)	18.2	-

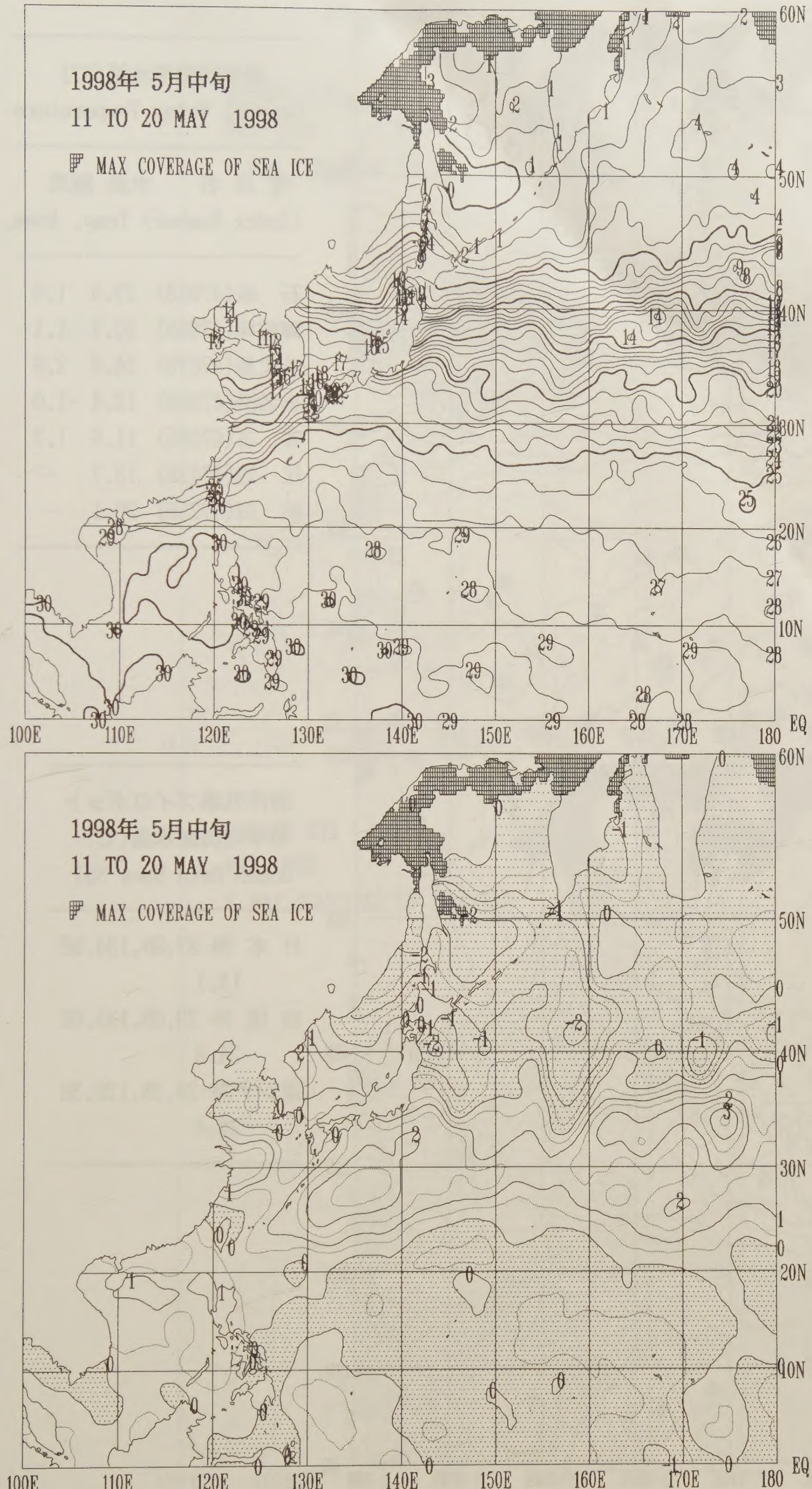


海洋気象ブイロボット
旬平均海面水温(℃)
Ocean Data Buoy SST

地点	位置	水温
日本海	37.9N,134.5E	15.1
四国沖	29.0N,135.0E	23.8
東シナ海	28.2N,126.3E	24.7

第1図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(1998年 5月上旬)

Fig.1 Ten-day mean SST (top) and anomalies (bottom) in the western North Pacific for the 1st ten-day period in MAY 1998. Anomalies are computed from the JMA climatology (1961-90). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.



旬平均沿岸水温(℃)
Coastal Water Temperature

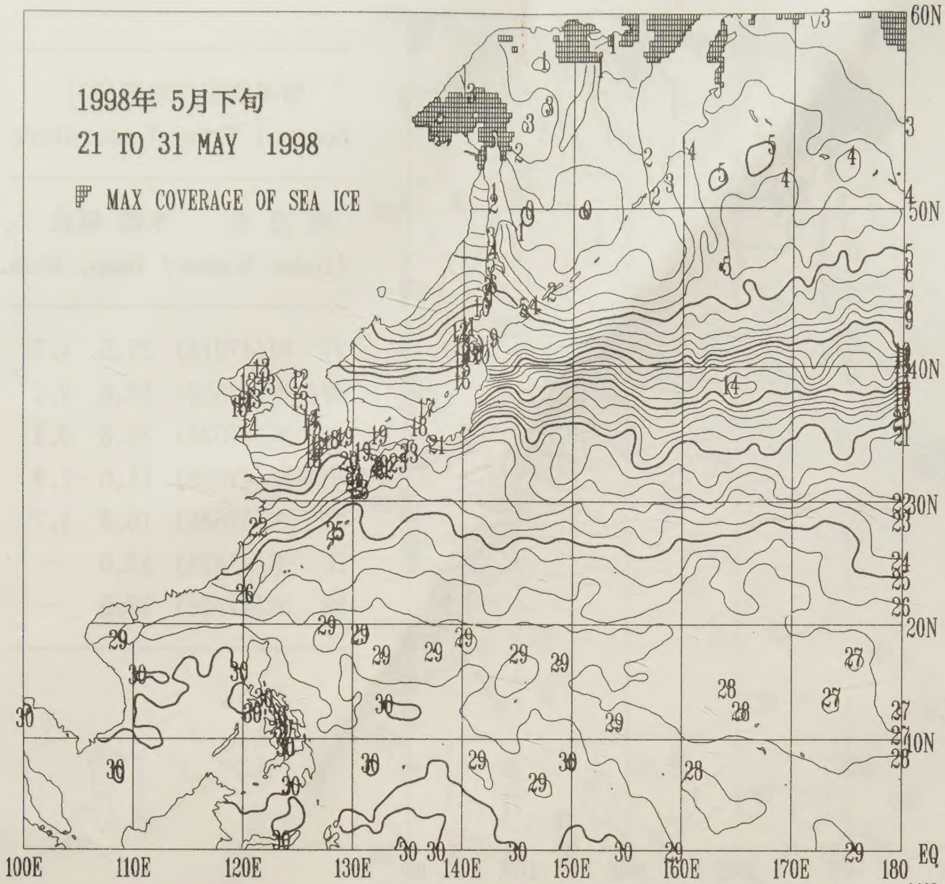
地 点 名 (Index Number)	水温 Temp.	偏差 Anom.
石　垣(47918)	27.5	1.3
御前崎(47655)	18.8	0.2
八丈島(47678)	23.8	3.1
小名浜(47598)	11.5	-1.4
宮　古(47585)	10.8	1.7
江　差(47428)	12.6	-
浜　田(47755)	18.5	-

海洋気象ブイロボット
旬平均海面水温(℃)
Ocean Data Buoy SST

日 本 海	37.9N,134.5E	16.1
四 国 沖	29.0N,135.0E	25.4
東シナ海	28.2N,126.3E	25.8

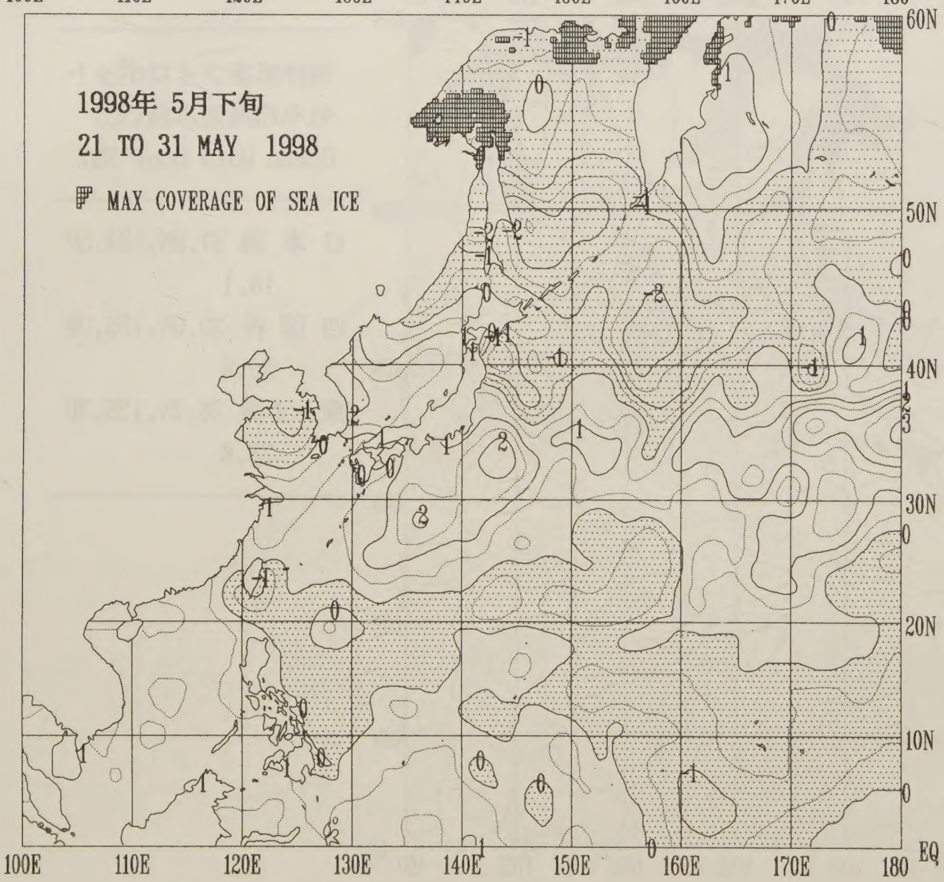
第2図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(1998年 5月中旬)

Fig.2 Ten-day mean SST (top) and anomalies (bottom) in the western North Pacific for the 2nd ten-day period in MAY 1998. Anomalies are computed from the JMA climatology (1961-90). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.



旬平均沿岸水温(℃)
Coastal Water Temperature

地点名 (Index Number)	水温 Temp.	偏差 Anom.
石　垣(47918)	27.5	1.0
御前崎(47655)	20.7	1.1
八丈島(47678)	24.0	2.9
小名浜(47598)	12.4	-1.0
宮　古(47585)	11.9	1.7
江　差(47428)	13.7	-
浜　田(47755)	20.1	-

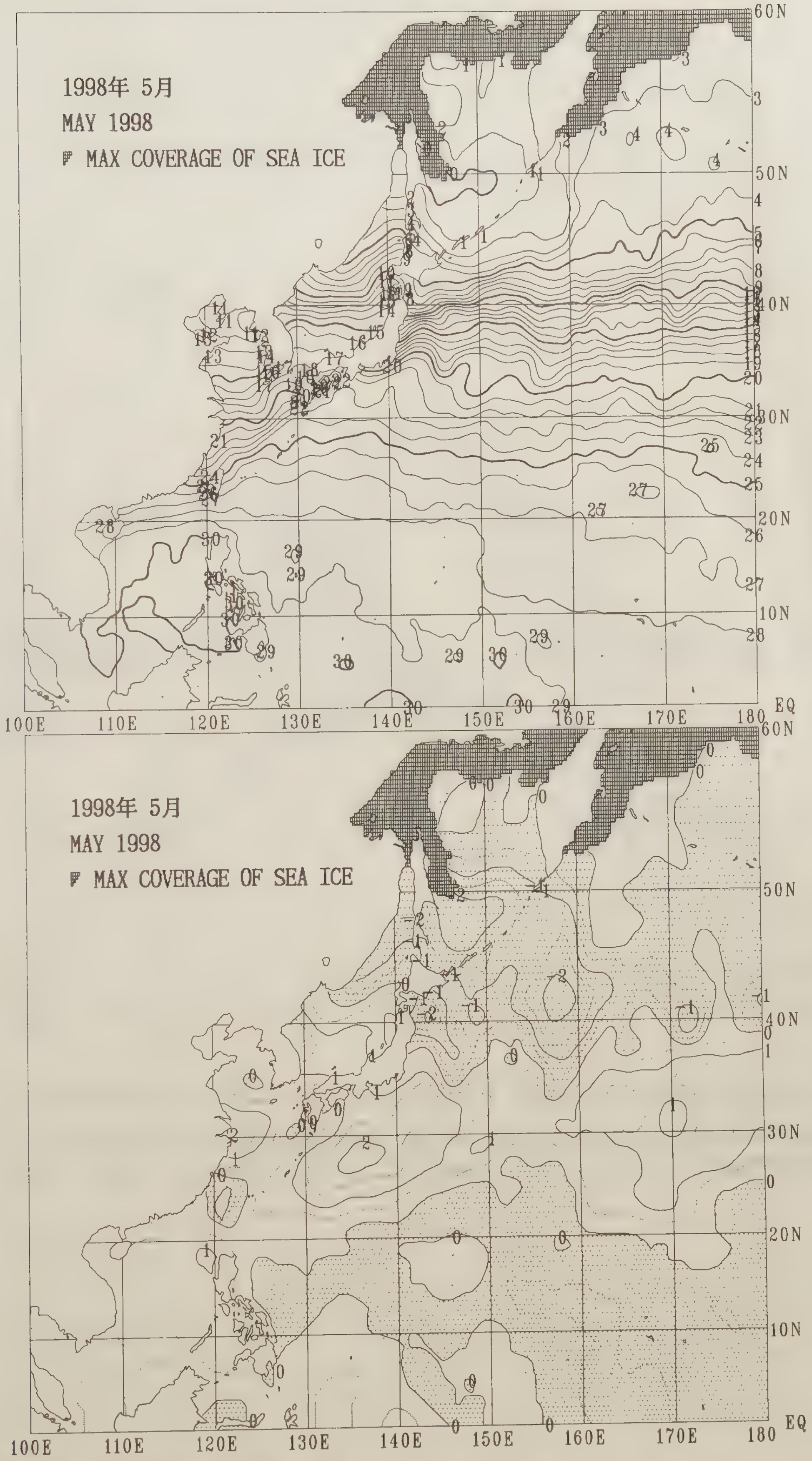


海洋気象ブイロボット
旬平均海面水温(℃)
Ocean Data Buoy SST

地点	位置	水温
日本海	37.9N,134.5E	18.1
四国沖	29.0N,135.0E	24.9
東シナ海	28.2N,126.3E	24.4

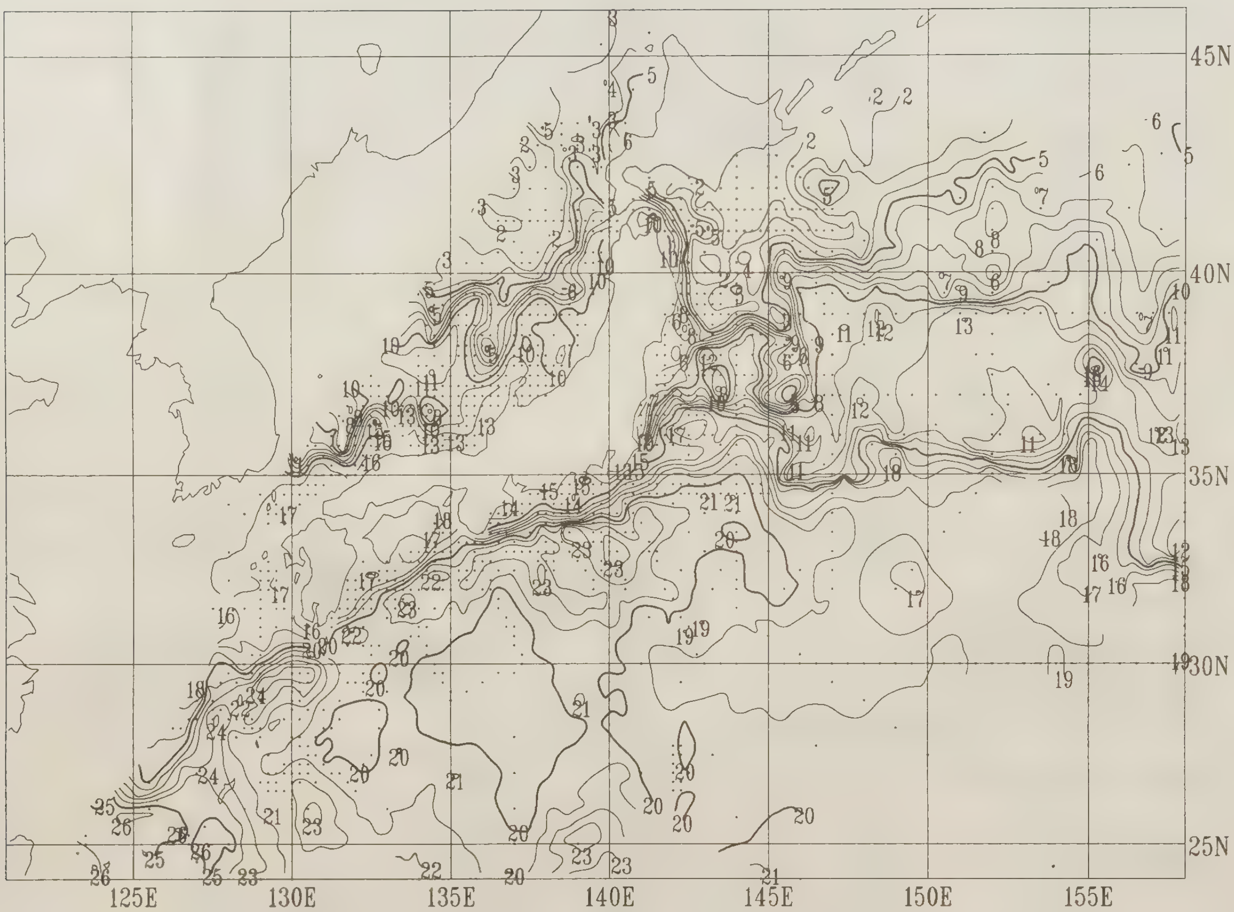
第3図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(1998年 5月下旬)

Fig.3 Ten-day mean SST (top) and anomalies (bottom) in the western North Pacific for the 3rd ten-day period in MAY 1998. Anomalies are computed from the JMA climatology (1961-90). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.



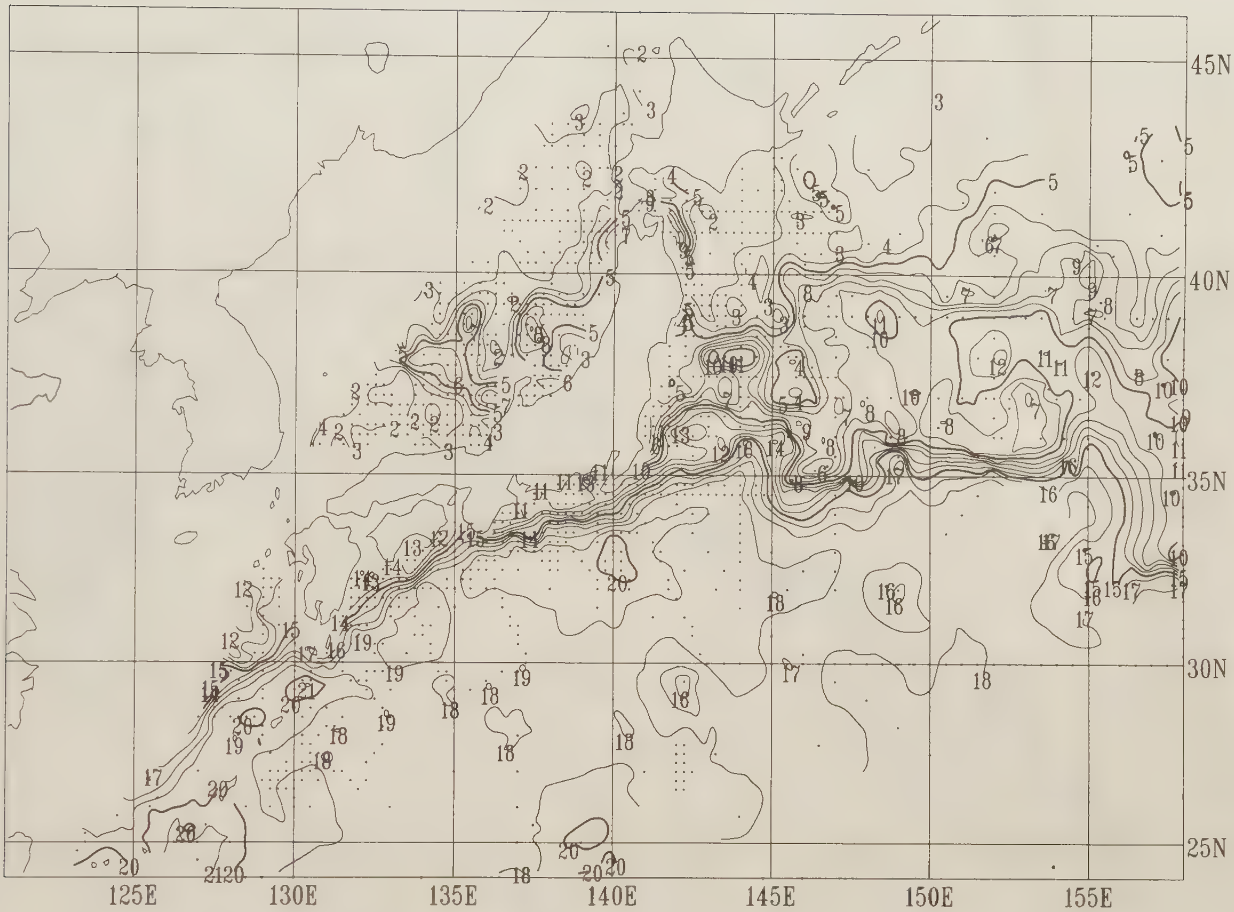
第4図 北西太平洋月平均海面水温図(上)及び偏差図(下)(1998年 5月)

Fig.4 Monthly mean SST (top) and anomalies (bottom) in the western North Pacific for MAY 1998. Anomalies are computed from the JMA climatology (1961-1990). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.



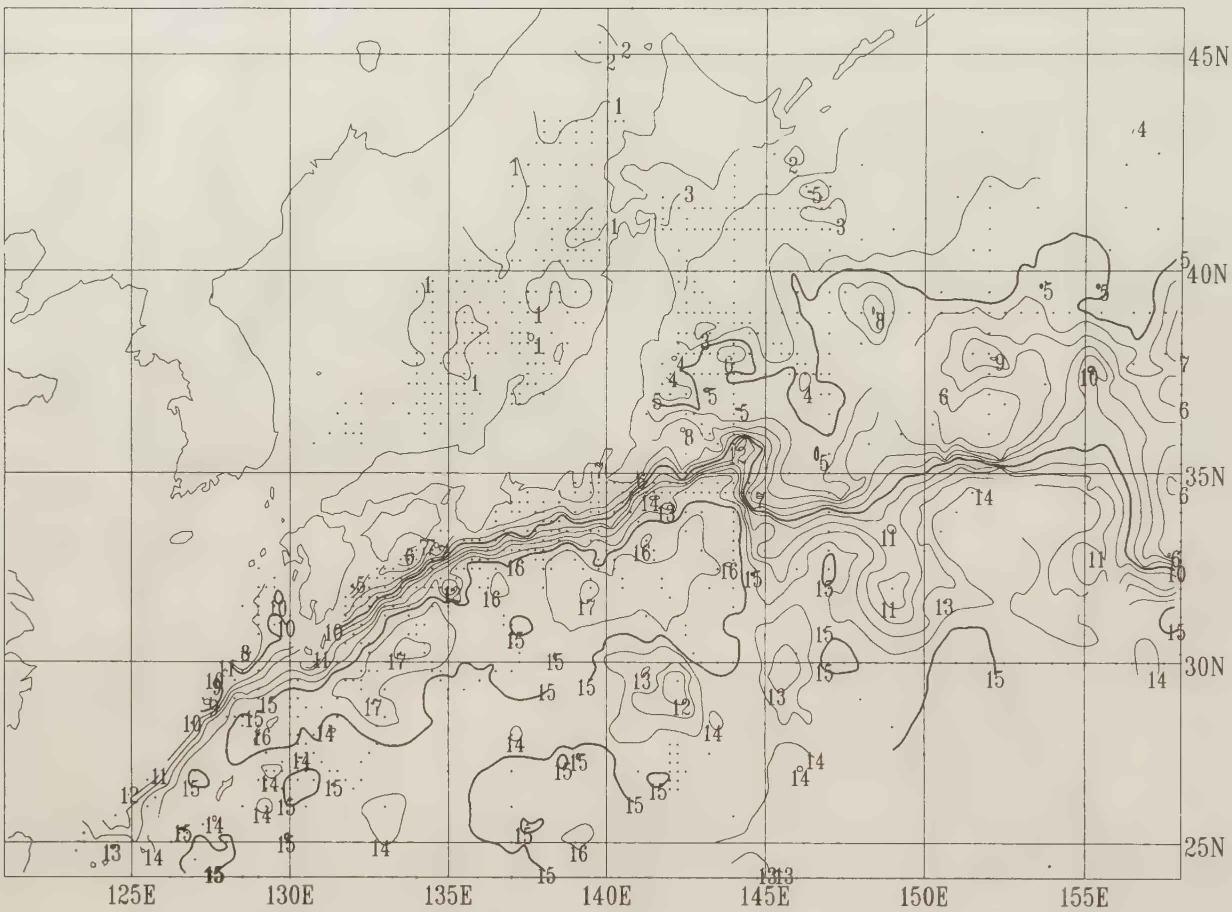
第5図　日本近海表層水温図(深さ100ｍ)(1998年 5月)

Fig.5 Subsurface (100m) temperatures in the seas adjacent to Japan for MAY 1998. Contour interval is 1°C. Observation points are denoted by dots.



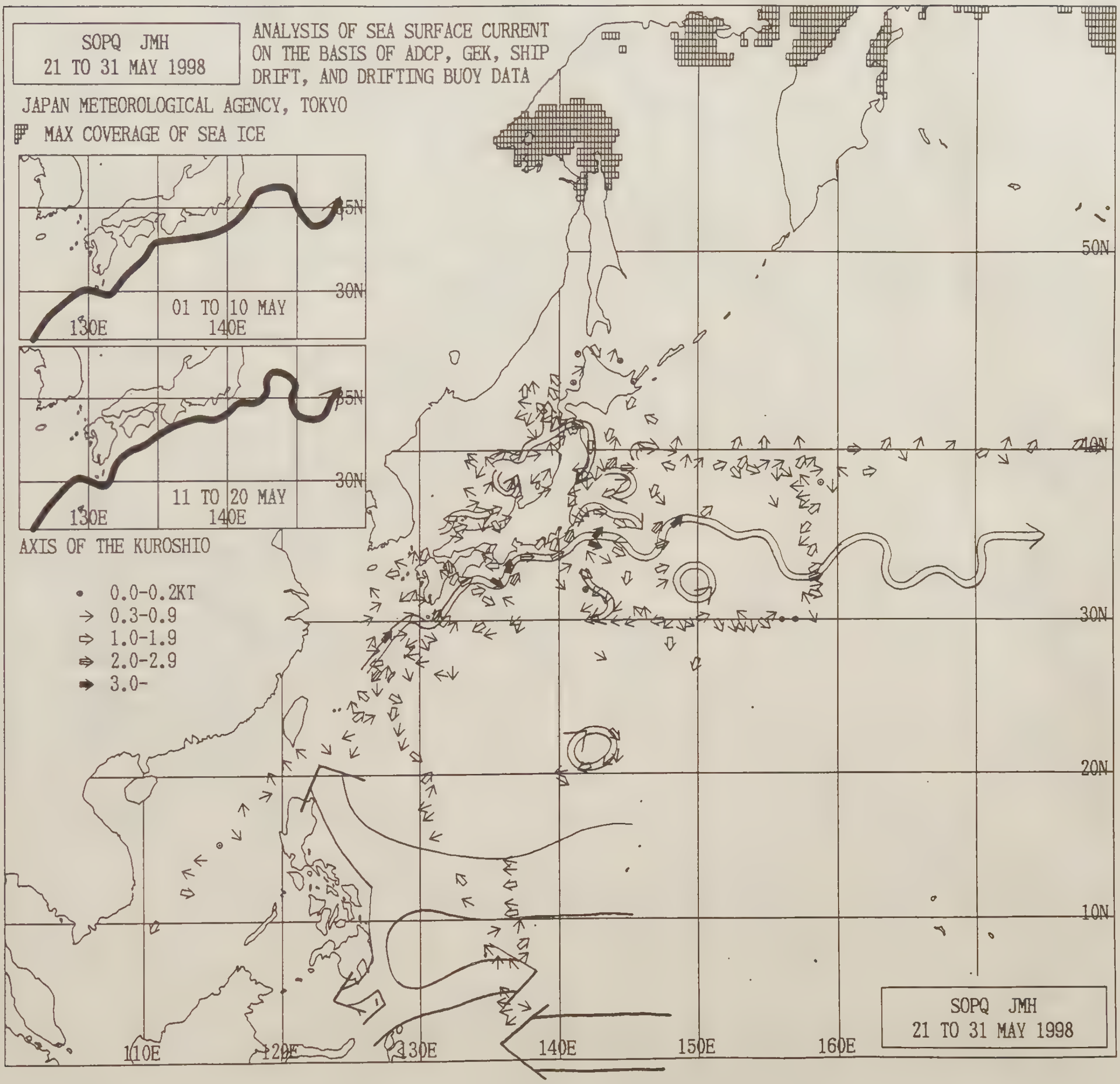
第6図　日本近海表層水温図(深さ200m)（1998年 5月）

Fig.6 Subsurface (200m) temperatures in the seas adjacent to Japan for MAY 1998. Contour interval is 1°C. Observation points are denoted by dots.



第7図　日本近海表層水温図(深さ400m) (1998年 5月)

Fig.7 Subsurface (400m) temperatures in the seas adjacent to Japan for MAY 1998. Contour interval is 1°C. Observation points are denoted by dots.



第8図　北西太平洋海流図（1998年 5月下旬）

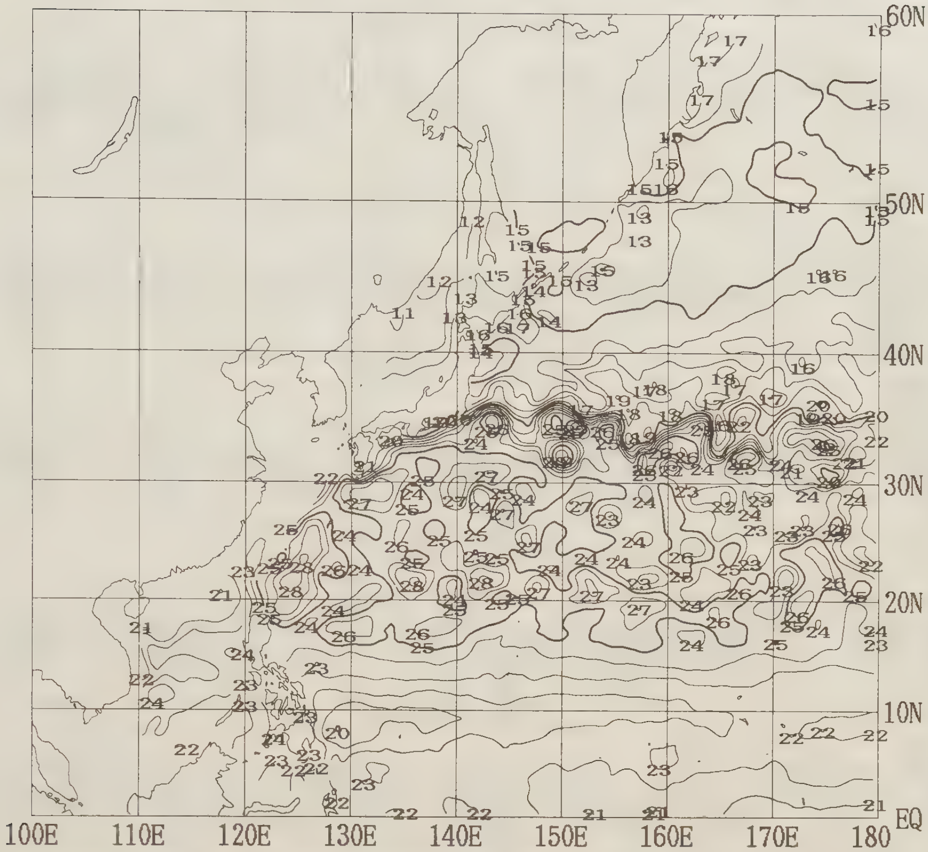
Fig.8 Analysis of the sea surface current in the western North Pacific for the 3rd ten-day period in MAY 1998. Small arrows indicate in situ observations. Major currents such as the Kuroshio and the North Equatorial Current are denoted by larger open arrows.



第9図 旬別黒潮流軸図

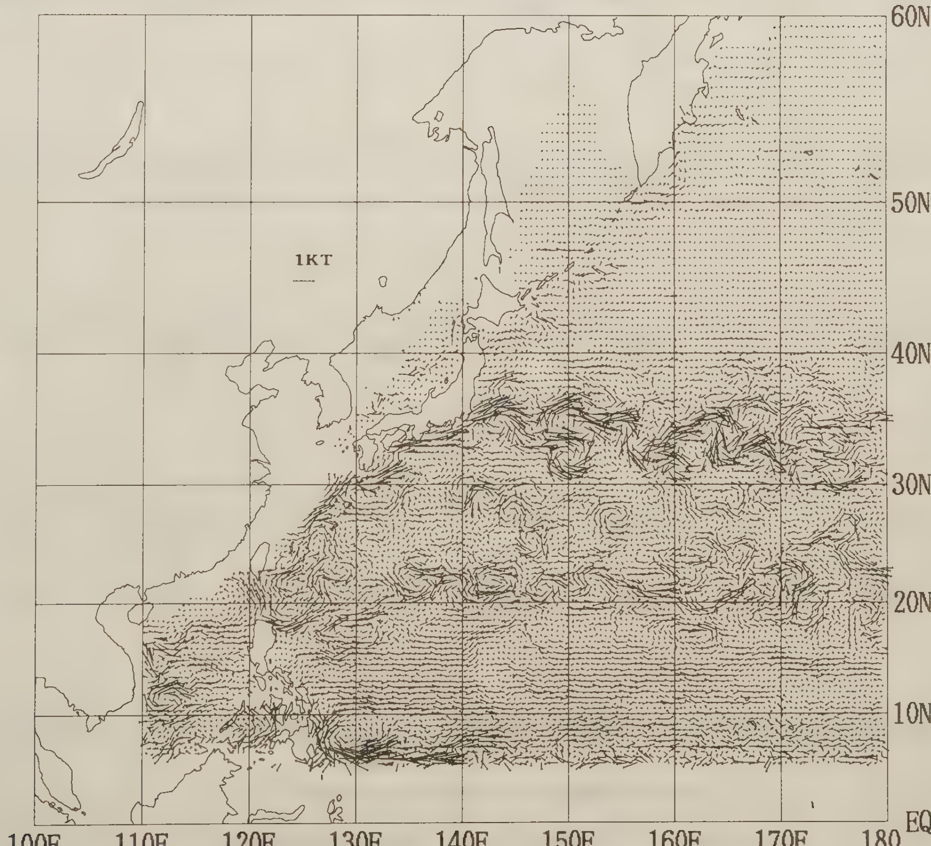
Fig.9 Location of the Kuroshio axis

Sea surface dynamic heights and current distribution



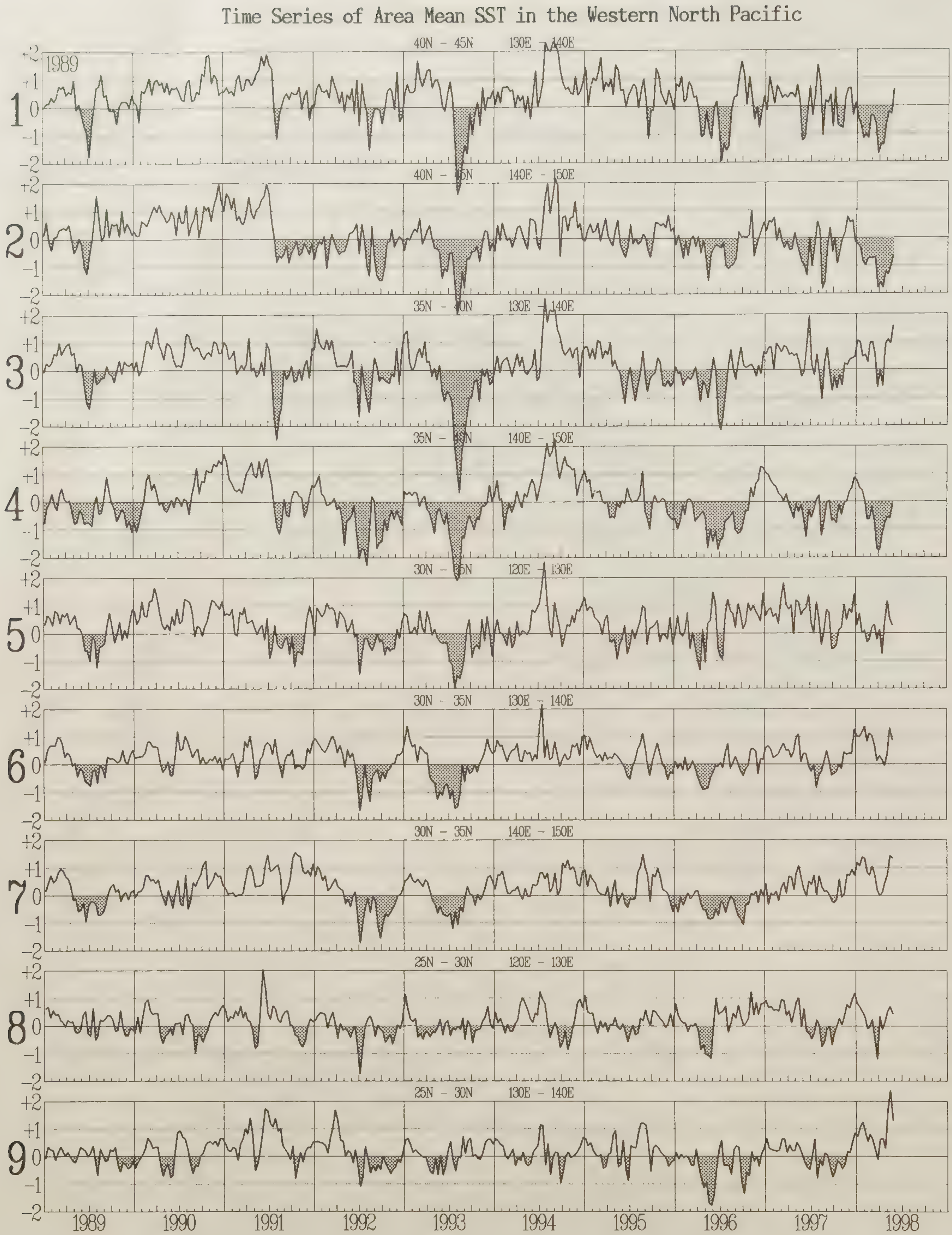
第10図 北西太平洋力学的海面高度分布図(1998年 5月2日)

Fig.10 Sea surface dynamic heights (10cm) in the western North Pacific derived from the altimeter data of TOPEX/POSEIDON (MAY 2, 1998).
1500db surface is assumed to be the surface of no motion.



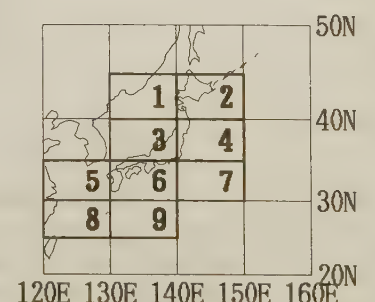
第11図 北西太平洋海流ベクトル図(1998年 5月2日)

Fig.11 Sea surface current vectors in the western North Pacific (MAY 2, 1998).
Vectors are derived from the sea surface dynamic heights from TOPEX/POSEIDON and subsurface temperature distribution assuming the geostrophic relation.

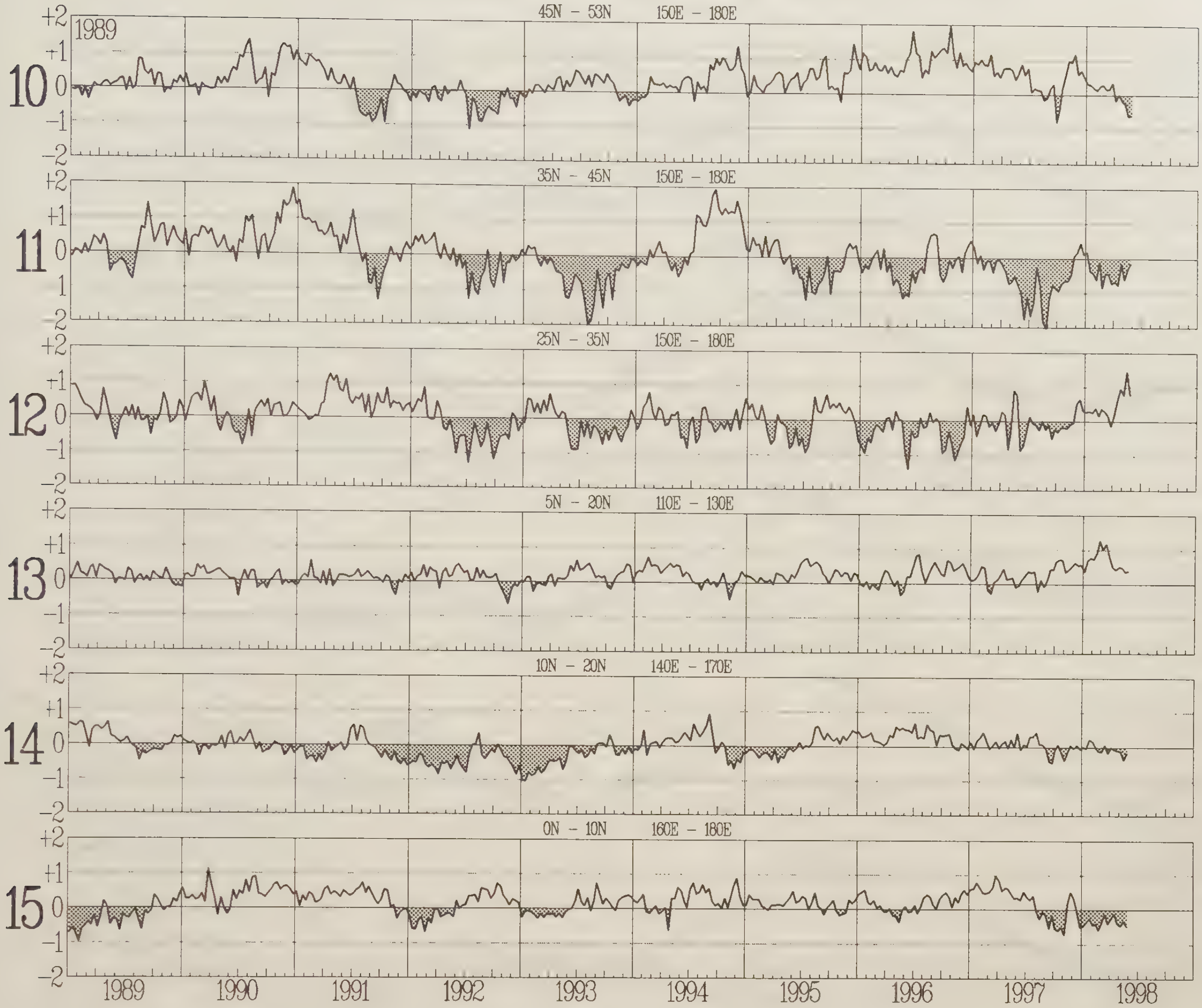


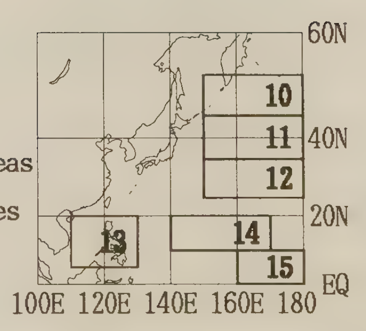
第12図　海域別旬平均海面水温平年偏差時系列図

Fig.12 Time series of the ten-day mean sea surface temperature anomalies (°C) in the western North Pacific for the areas shown in the right panel. Negative anomalies are shaded. Anomalies are computed from the JMA climatology (1961-90).



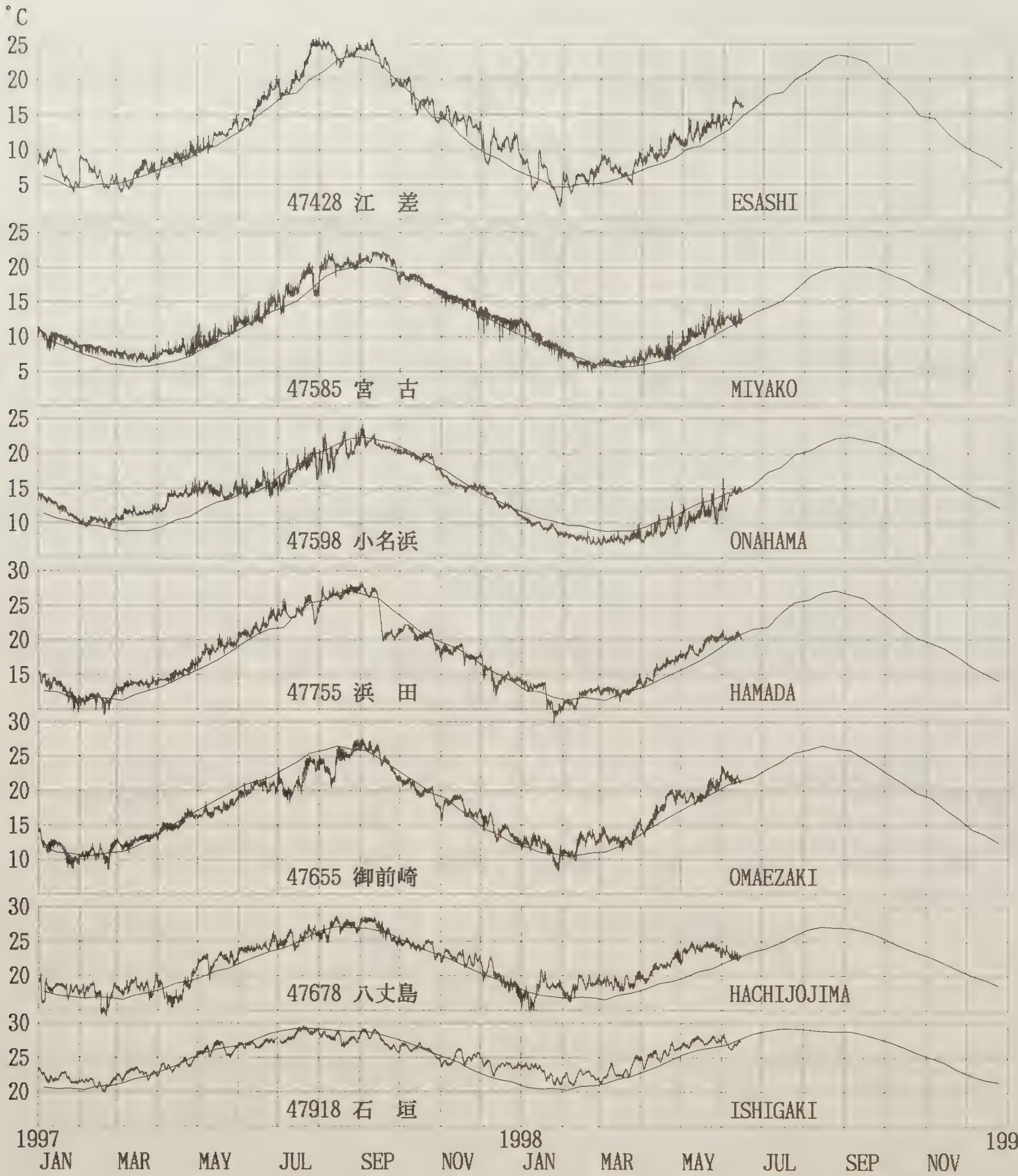
Time Series of Area Mean SST in the Western North Pacific





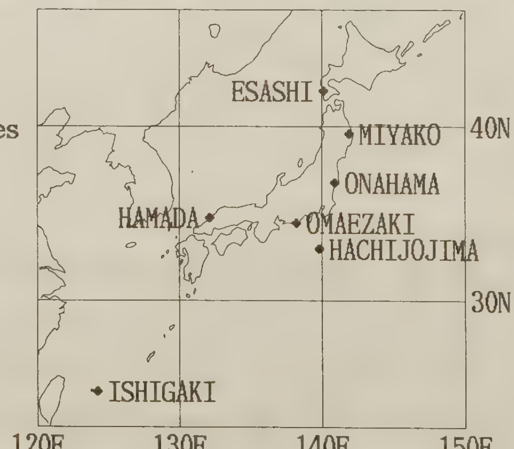
第12図　海域別旬平均海面水温平年偏差時系列図（つづき）

Fig.12 (continue) Time series of the ten-day mean sea surface temperature anomalies (°C) in the western North Pacific for the areas shown in the right panel. Negative anomalies are shaded. Anomalies are computed from the JMA climatology (1961-90).

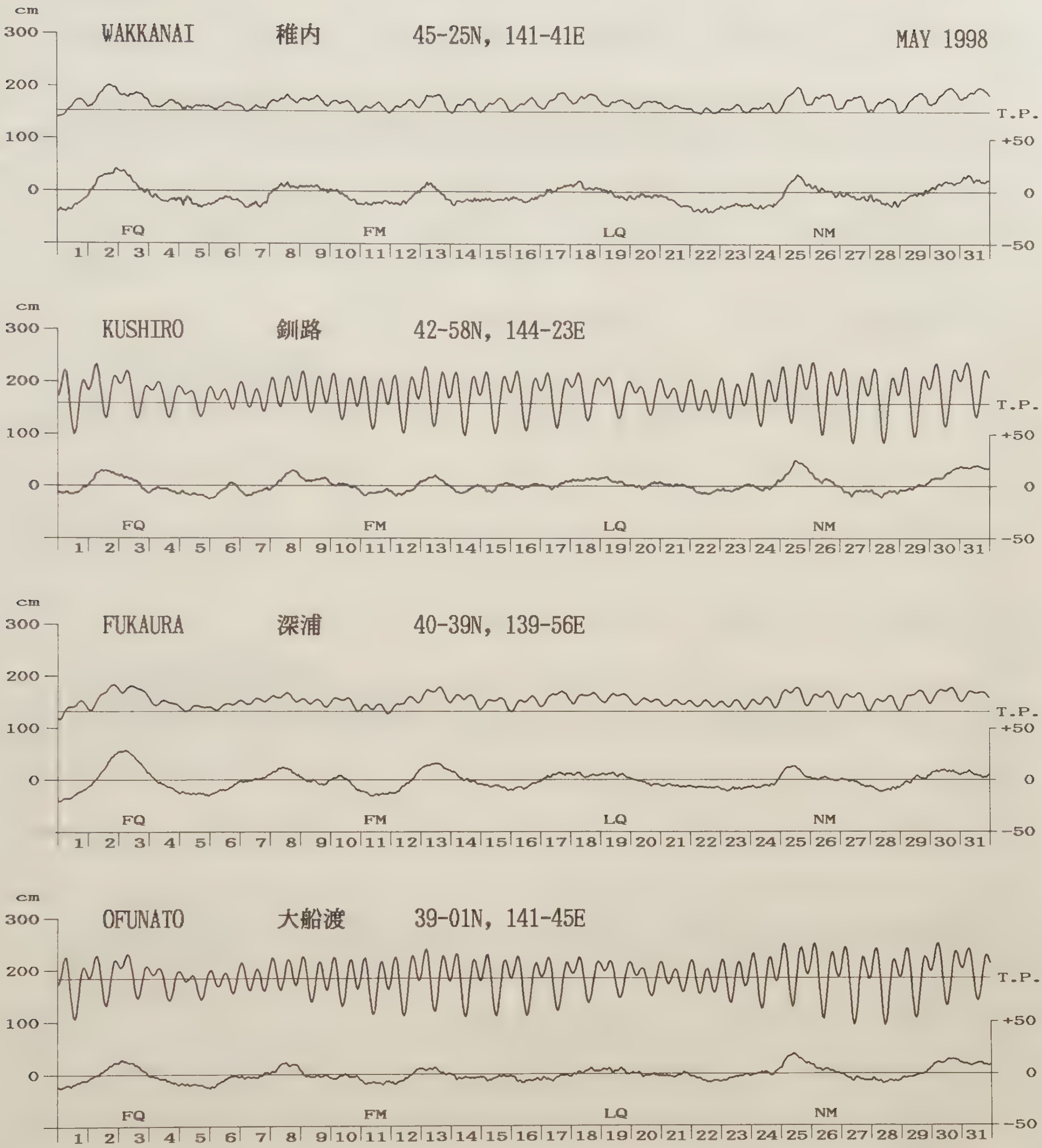


第13図 沿岸水温時系列図

Fig.13 Time series of hourly coastal water temperatures (°C) measured at 7 coastal stations of the JMA shown in the right panel.
Thin lines show ten-day mean climatology.

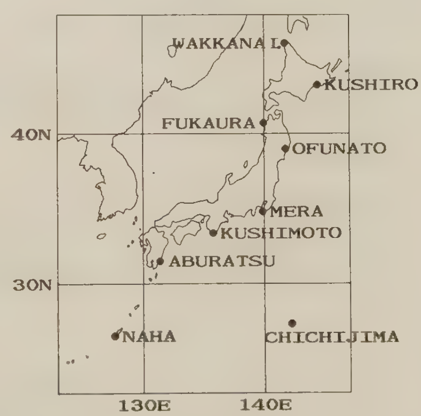


Time Series of Sea Level

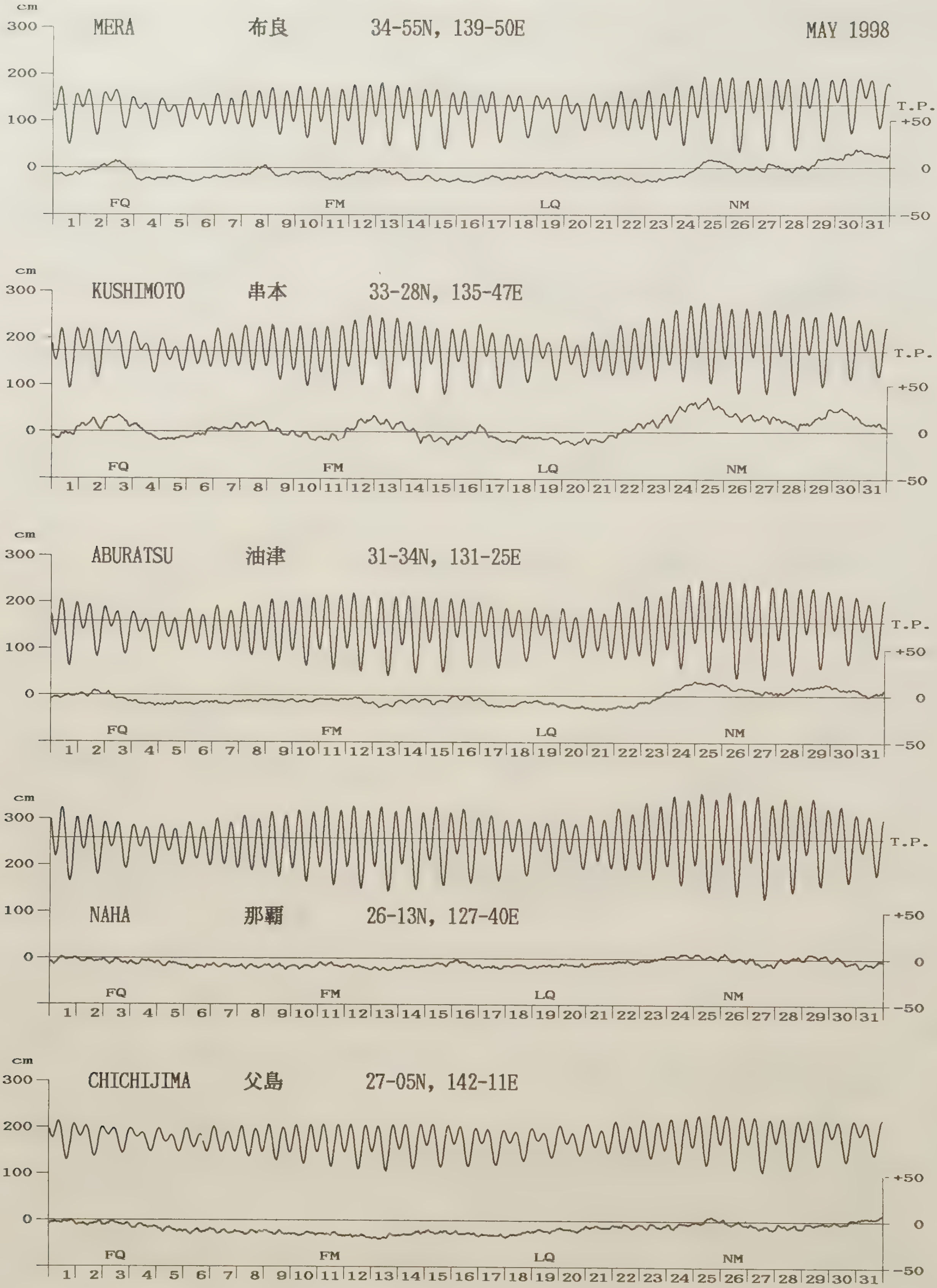


第14図 沿岸潮位時系列図 (1998年 5月)

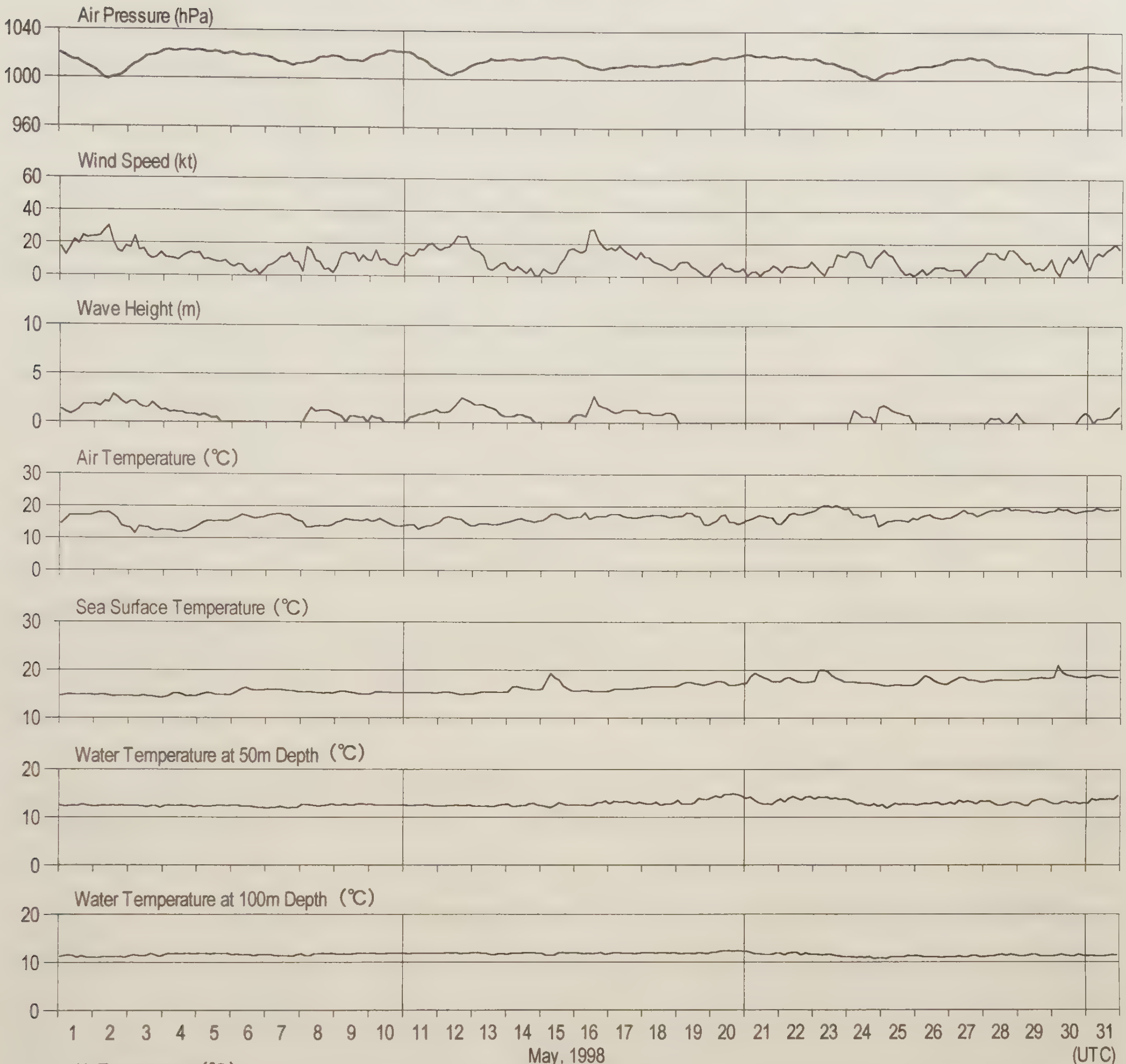
Fig.14 Time series of hourly sea level observation (upper line) and its anomalies (lower line) at 9 stations of the JMA in the right panel.
Short term variations are removed from raw data.

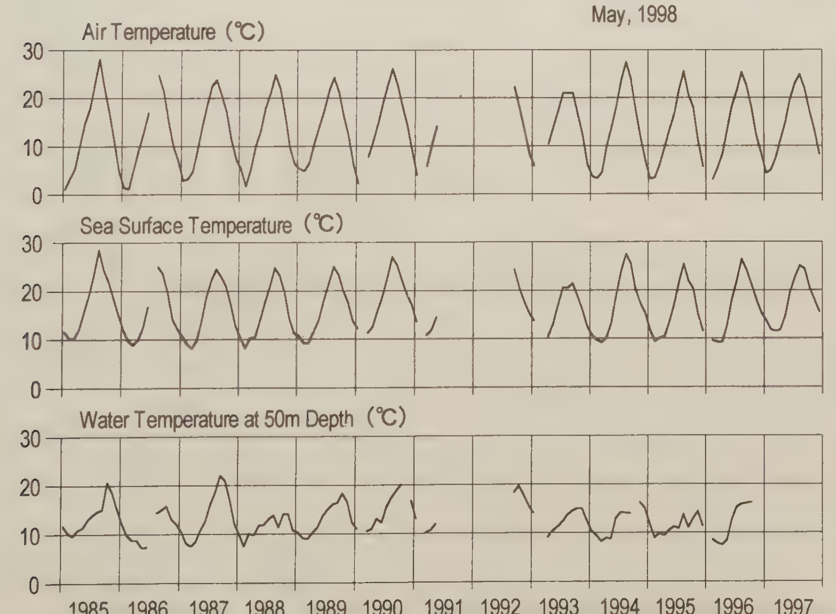


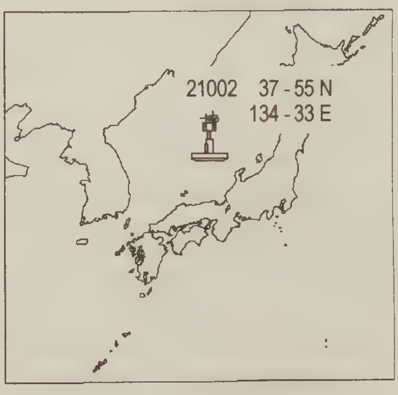
FM: full moon, FQ: first quarter
NM: new moon, LQ: last quarter
T.P.: Mean sea level of Tokyo Bay (Tokyo Peil)



第14図 つづき
Fig.14 continue

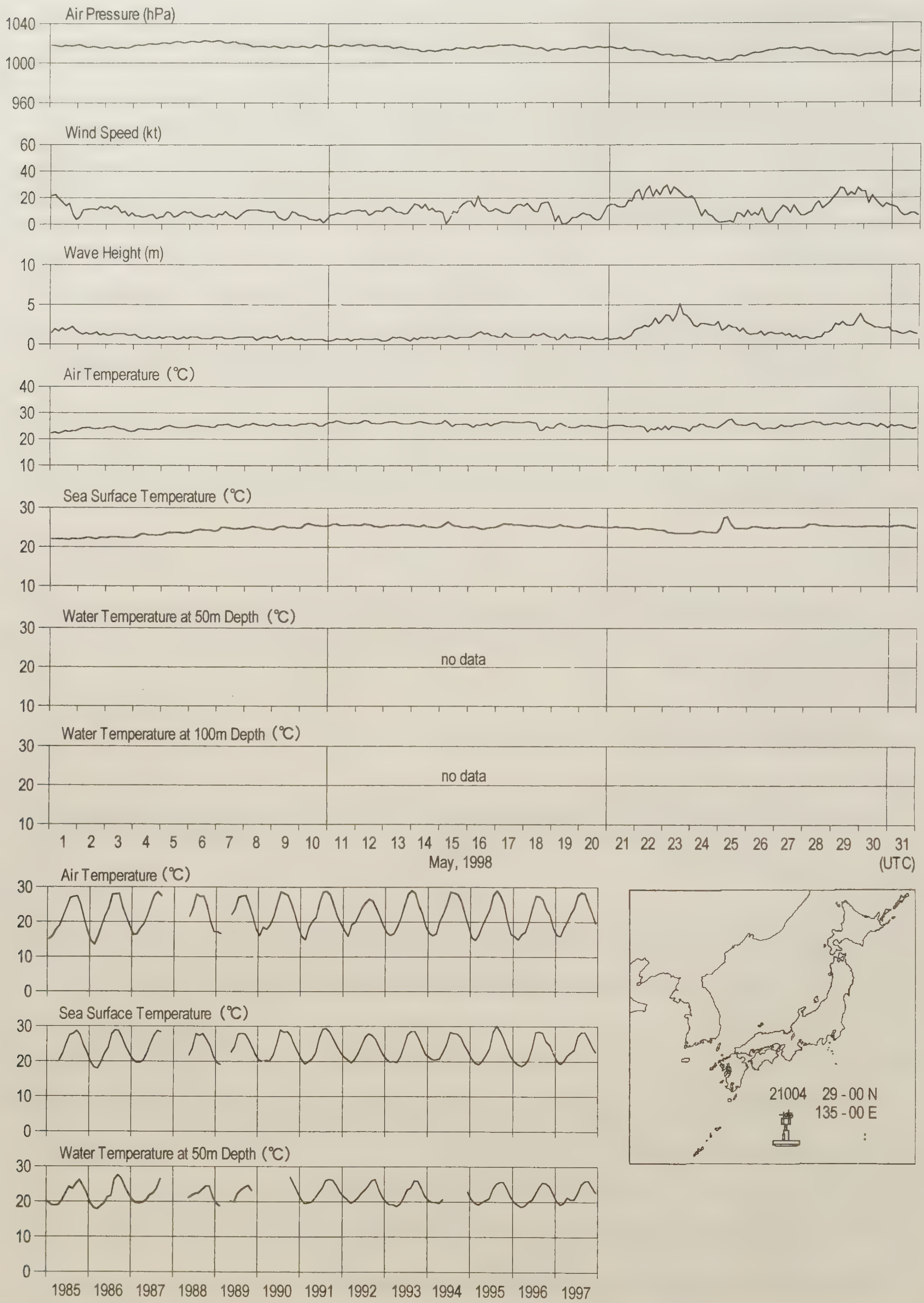






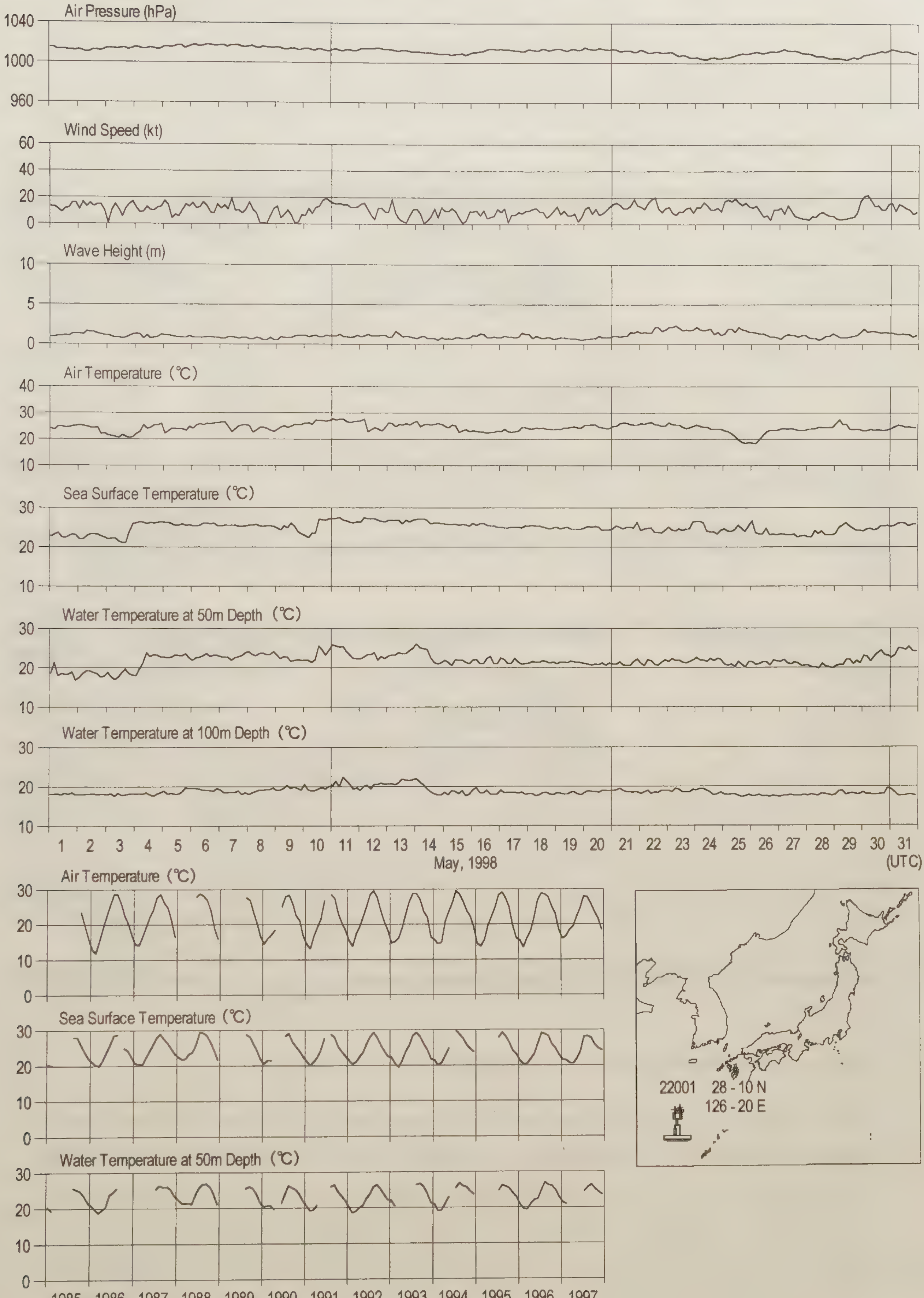
第15図　海洋気象ブイロボットによる観測要素の時系列図（日本海：21002）
上段は３時間毎の観測値を、下段は月平均値を示す。

Fig. 15　Time series of JMA buoy observation in the Japan Sea (WMO ID No. 21002). The upper panel shows three hourly observation and the lower panel shows the monthly mean data.



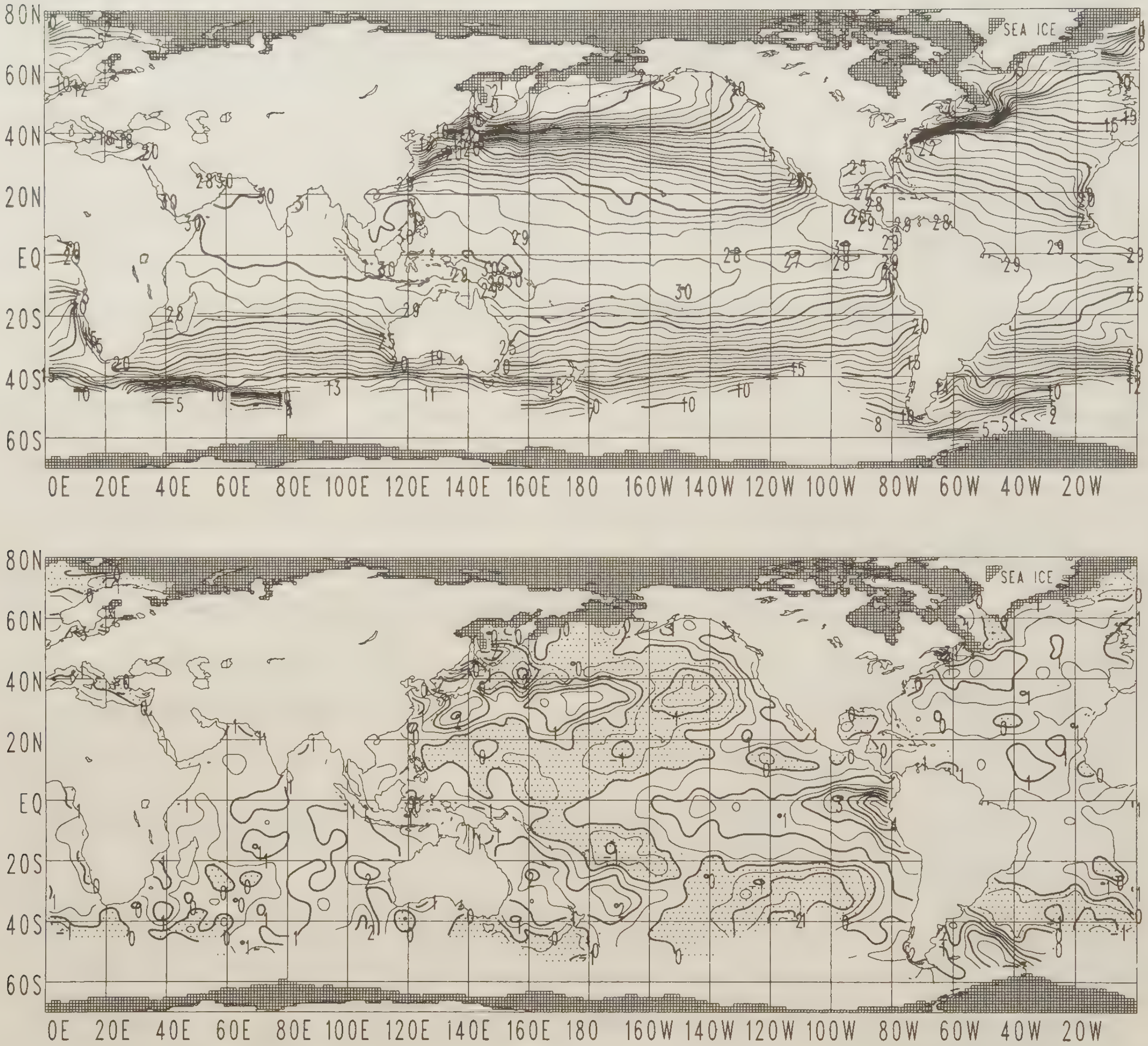
第15図　海洋気象ブイロボットによる観測要素の時系列図（四国沖：21004）
上段は3時間毎の観測値を、下段は月平均値を示す。

Fig. 15　Time series of JMA buoy observation south of Shikoku (WMO ID No. 21004). The upper panel shows three hourly observation and the lower panel shows the monthly mean data.



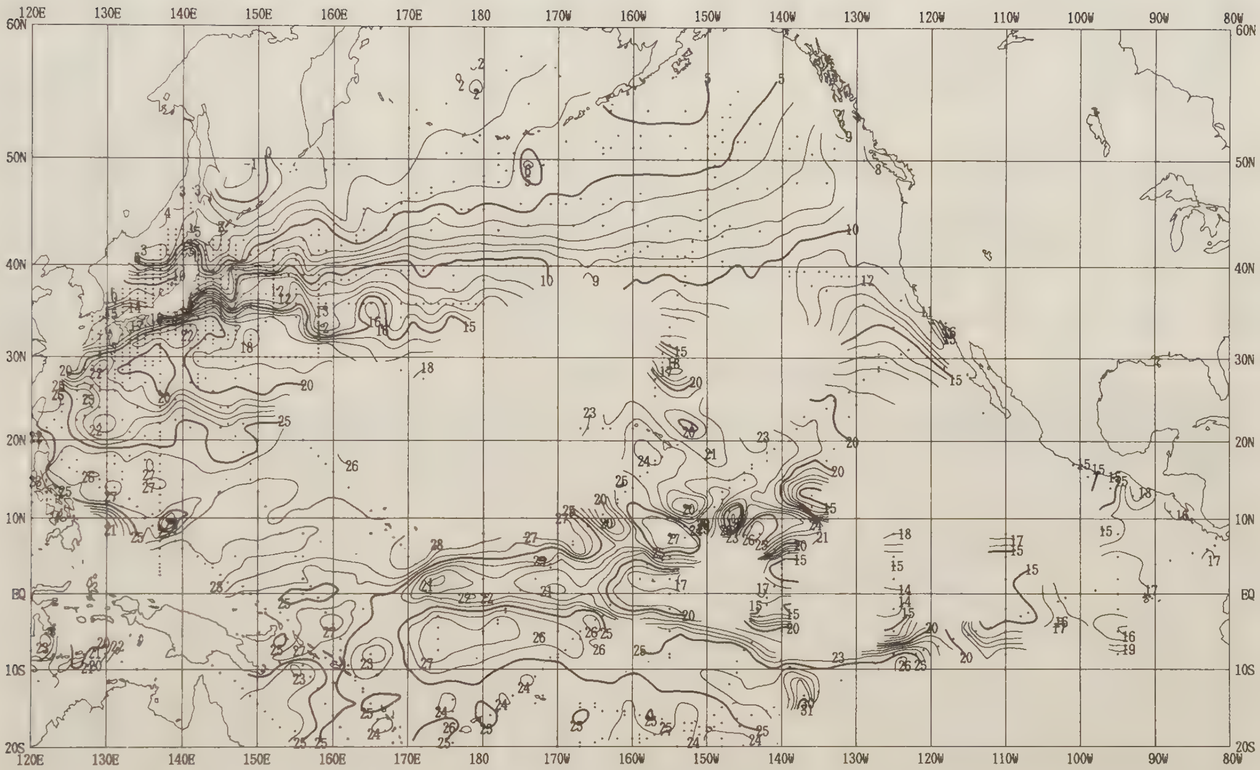
第15図　海洋気象ブイロボットによる観測要素の時系列図（東シナ海：22001）
上段は３時間毎の観測値を、下段は月平均値を示す。

Fig. 15　Time series of JMA buoy observation in the East China Sea (WMO ID No. 22001).
The upper panel shows three hourly observation and the lower panel shows the monthly mean data.



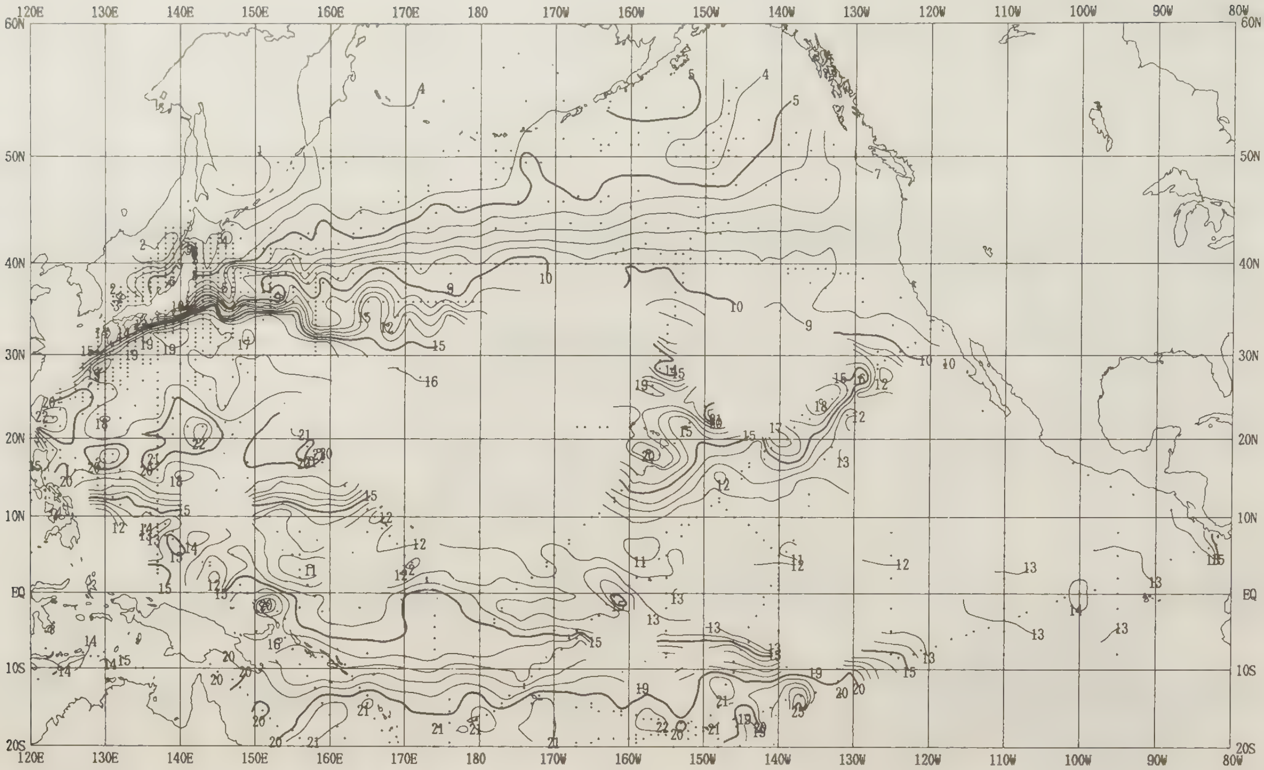
第16図　全球月平均海面水温図（上）及び偏差図（下）（1998年 5月）

Fig.16 Monthly mean sea surface temperature over the global ocean (top) and anomalies (bottom) for MAY 1998. Anomalies are computed from the JMA climatology (1961-1990). Contour interval is 1°C (top) and additional anomaly contours of ±0.5°C are shown by thin lines. Negative anomalies are spotted. Maximum coverage of sea ice is shaded. Data sources for sea ice are U.S. National Ice Center (polar regions) and JMA (the Sea of Okhotsk).



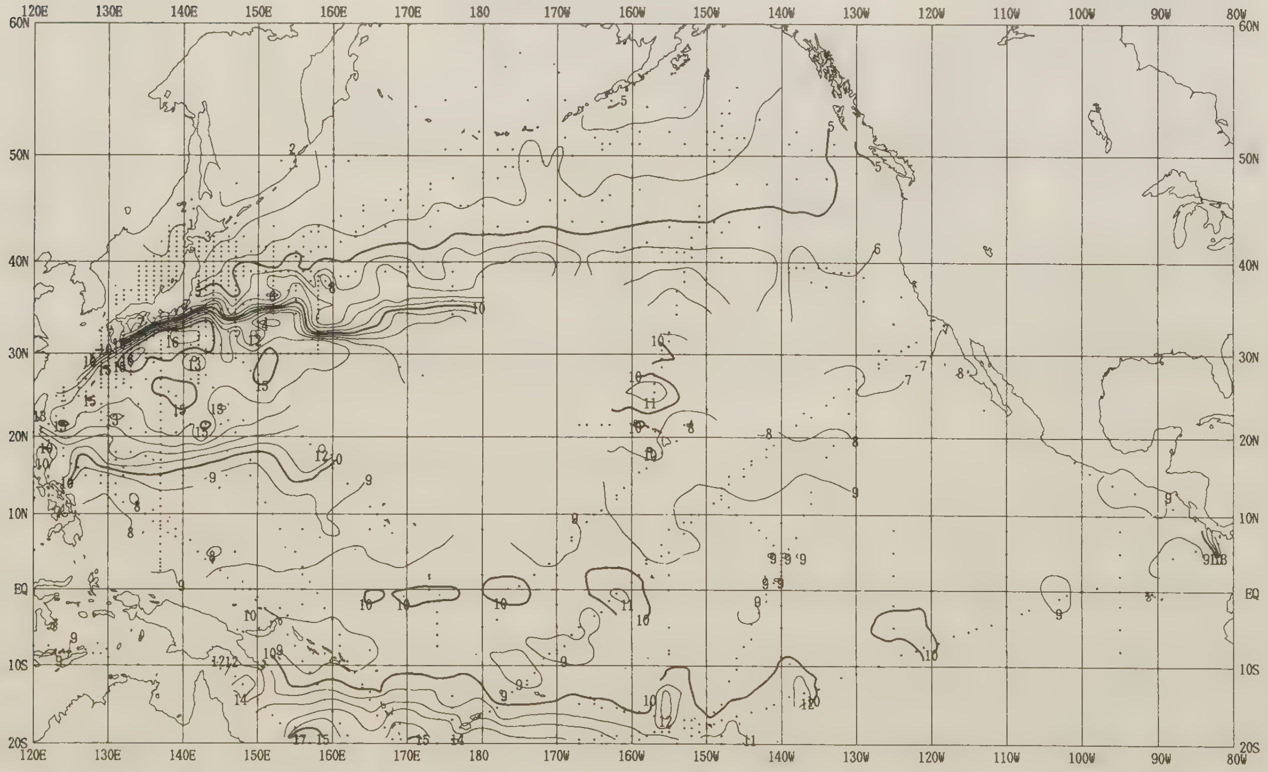
第17図　太平洋表層水温図(深さ100m) (1998年 5月)

Fig.17 Subsurface (100m) temperatures in the Pacific Ocean for MAY 1998. Contour interval is 1°C. Observation points are denoted by dots.



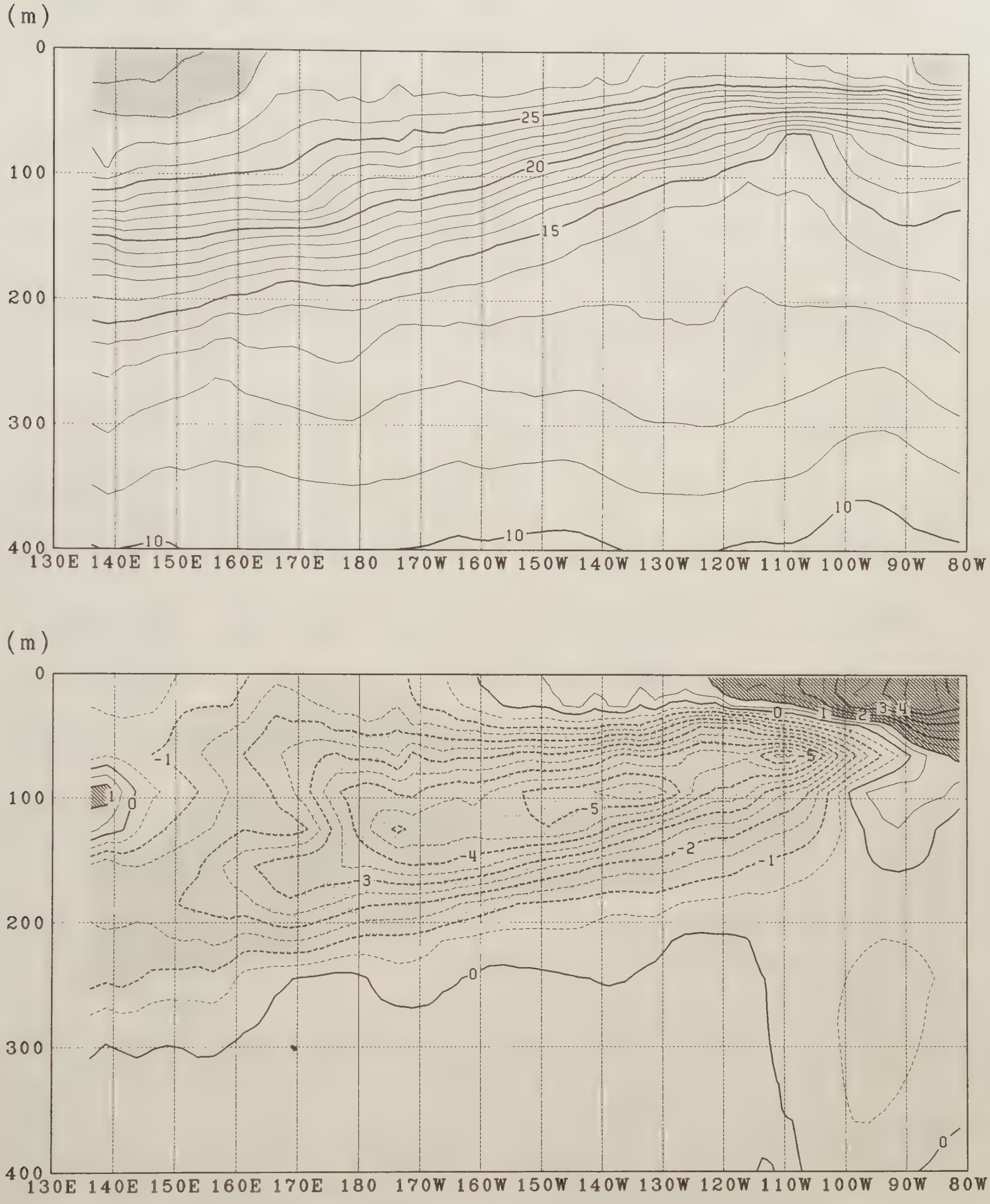
第18図　太平洋表層水温図(深さ200m) (1998年 5月)

Fig.18 Subsurface (200m) temperatures in the Pacific Ocean for MAY 1998. Contour interval is 1°C. Observation points are denoted by dots.



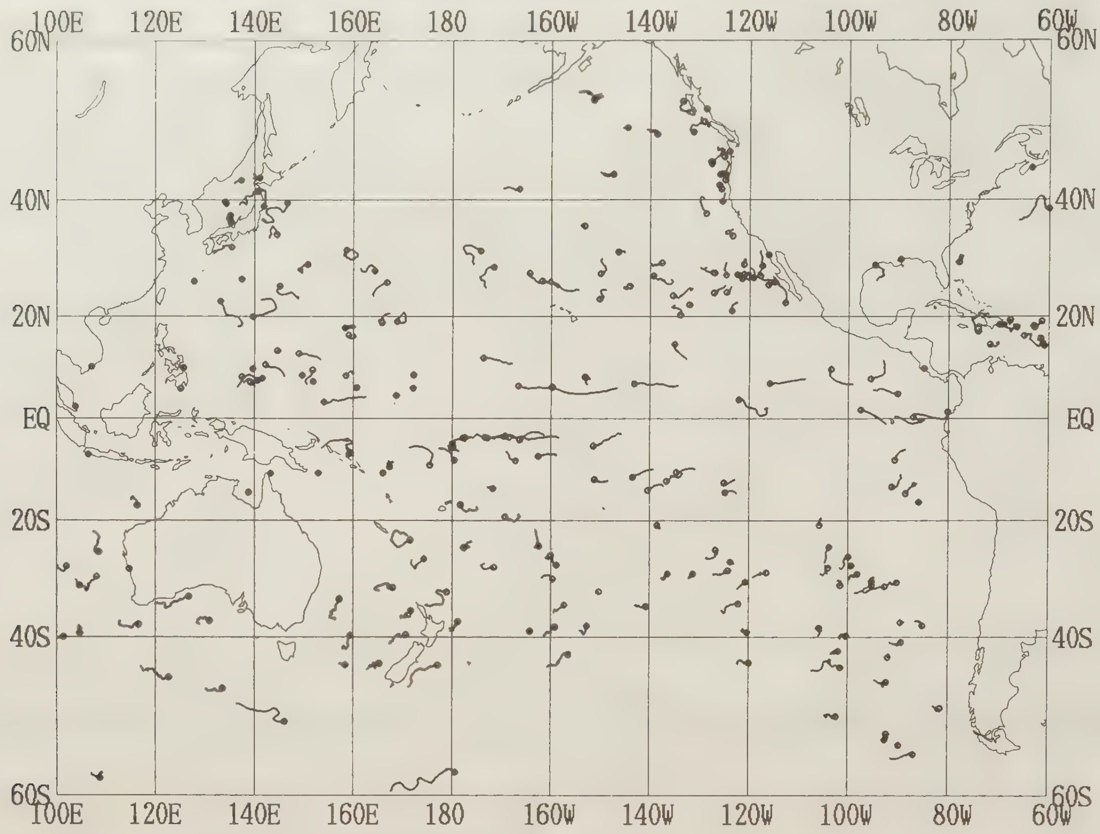
第19図　太平洋表層水温図(深さ400m) (1998年 5月)

Fig.19 Subsurface (400m) temperatures in the Pacific Ocean for MAY 1998. Contour interval is 1°C. Observation points are denoted by dots.



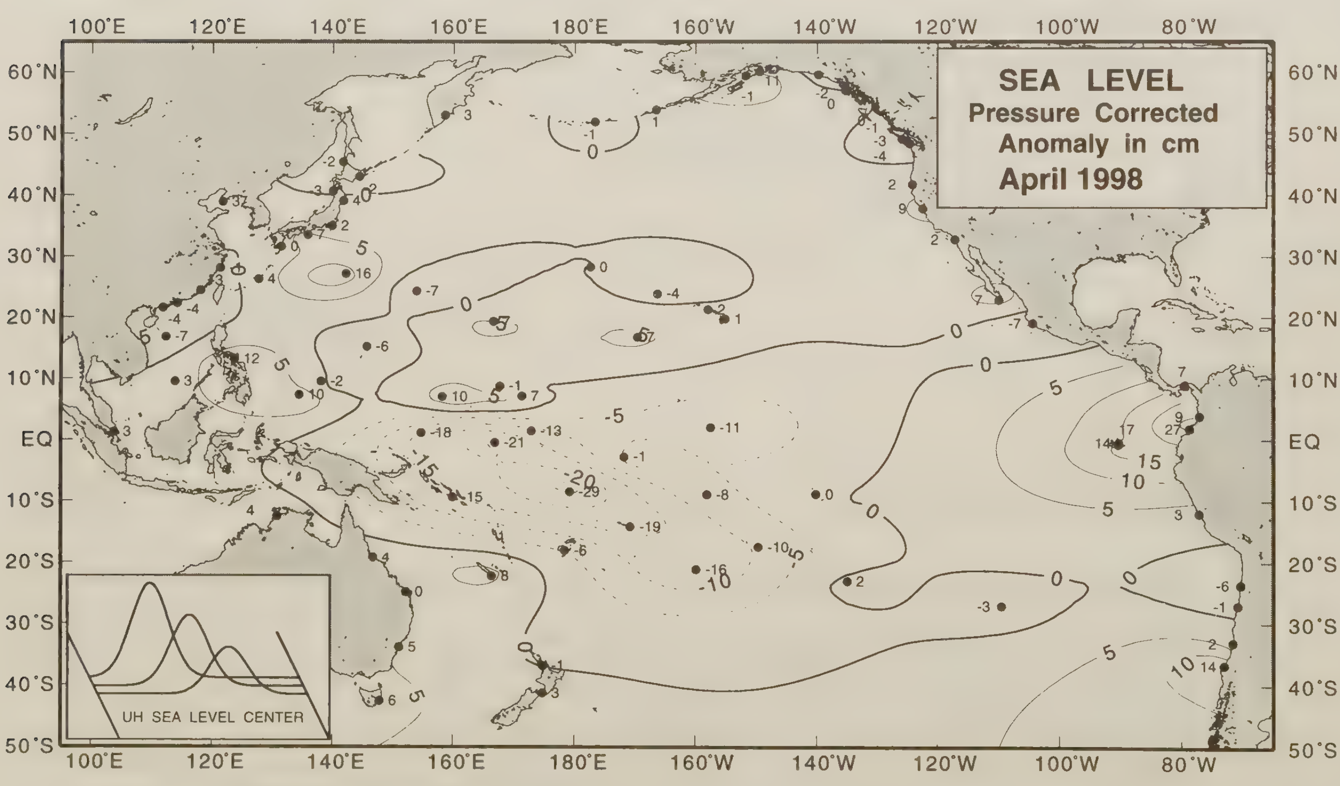
第20図　太平洋赤道に沿う表層水温（上）及び偏差（下）の深度－経度断面図（1998年 5月）

Fig.20 Depth-longitude sections of temperature (top) and anomalies (bottom) along the equator in the Pacific Ocean for MAY 1998. Data are derived from the Ocean Data Assimilation System of JMA. Contour interval is 1°C (top) and 0.5°C (bottom). Values greater than 28°C in the top panel are shaded. In the bottom panel, values greater than 1°C are shaded and values less than -1°C are spotted. Anomalies are computed from 1987-1997 base period means.



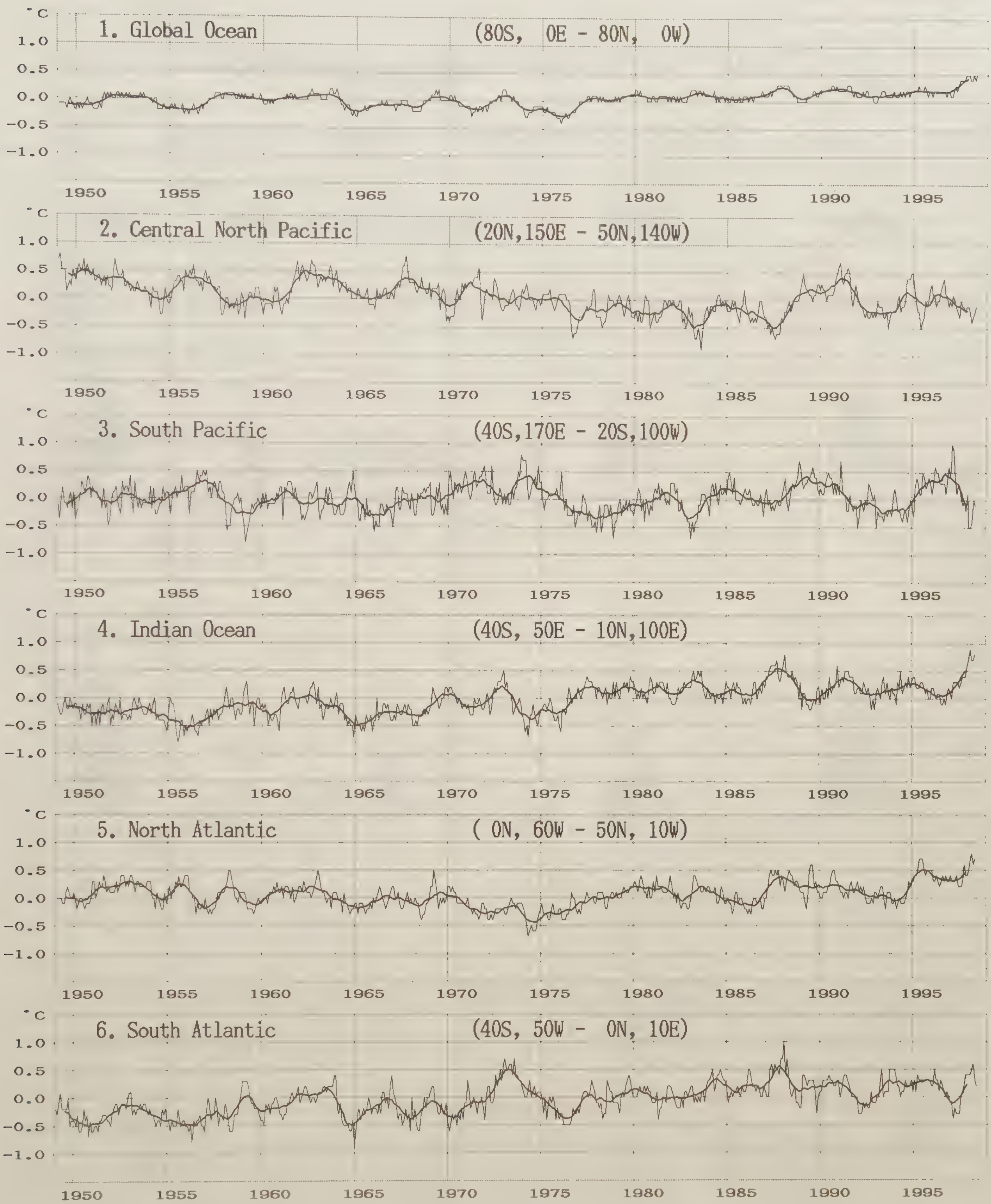
第21図　太平洋ブイ流跡図(1998年 5月)

Fig.21　Movements of drifting buoys in the Pacific Ocean during MAY 1998.
Each track is for one buoy.　Small circles represent last positions for the month.



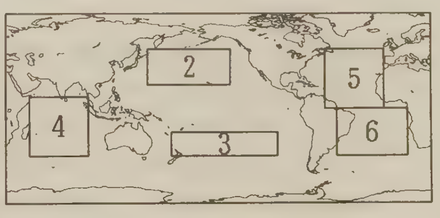
第22図　太平洋海面水位偏差図 (1998年 4月)

Fig.22　Monthly sea level anomalies for APR 1998 obtained from mean sea level (1975-1995) adjusted for atmospheric pressure.　This figure is prepared by the SOC of ISLP-PAC, Dept. of Oceanography, Univ. of Hawaii.

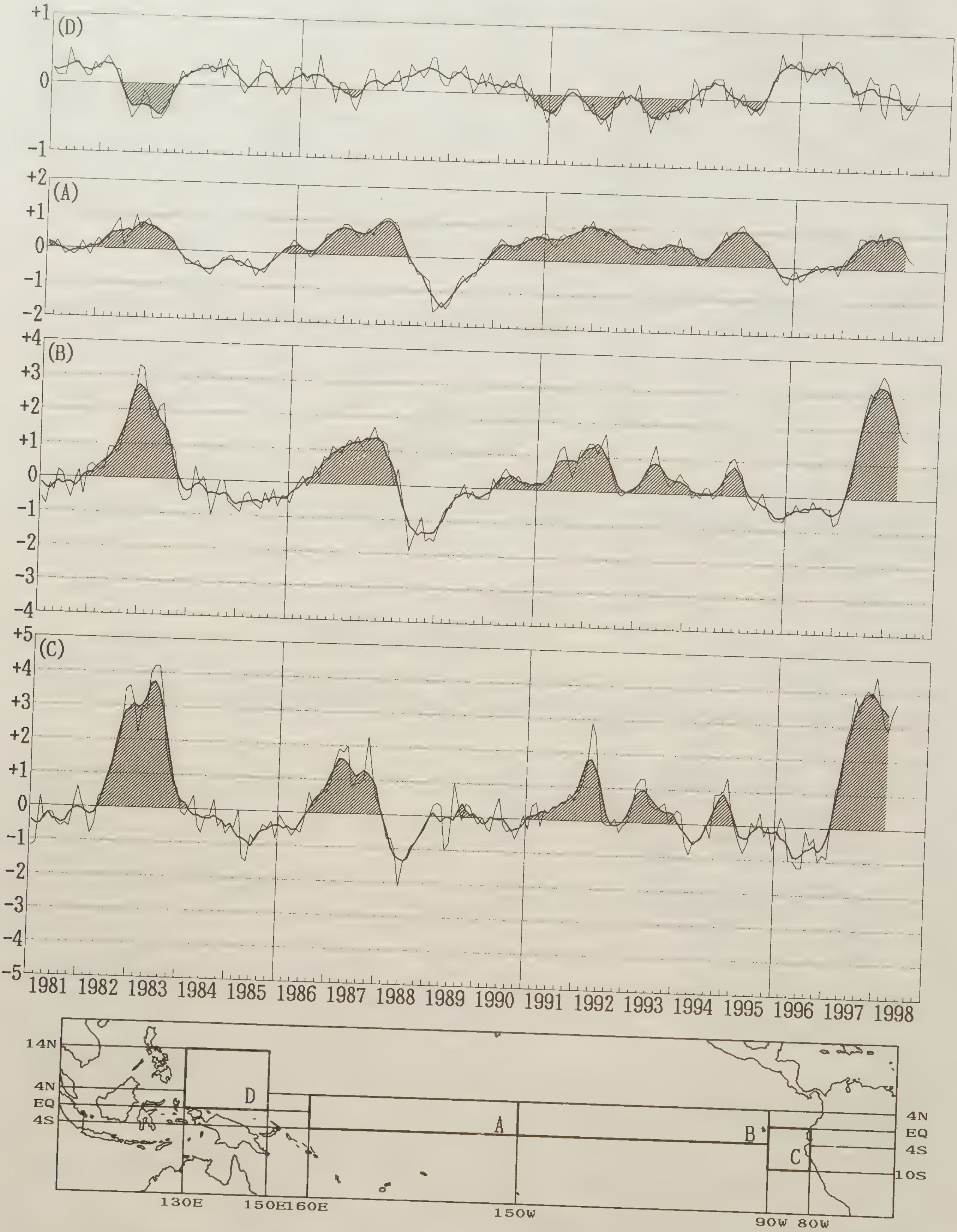


第23図 海域平均海面水温偏差の長期変動

Fig.23 Long-term variations of monthly mean sea surface temperature anomalies (°C) for the areas shown in the right panel. Anomalies are computed from the JMA climatology (1961-90). Thin lines show the monthly mean and thick lines their 13-month running means.



Time Series of Equatorial Pacific SST Anomalies



第24図　太平洋赤道域の海面水温偏差時系列図

Fig.24 Time series of monthly mean SST anomalies (°C) in the equatorial Pacific Ocean for the areas indicated at the bottom panel. Thin lines show the monthly means and thick lines their 5-month running means. Positive anomalies (A, B, C) and negative anomalies (D) are shaded. Anomalies are computed from the JMA climatology (1961-1990).

MONTH	REGION D 14N-EQ 130E-150E		REGION A 4N-4S 160E-150W		REGION B 4N-4S 150W-90W		REGION C EQ-10S 90W-80W		SOI	SEA LEVEL PRESSURE ANOMALY (hPa) TAHITI 17-33S 149-37W	DARWIN 12-24S 130-52E
	SEA SURFACE TEMPERATURE AND ANOMALY (°C)										
JAN 96	29.0	0.5	27.9	-0.1	25.0	-0.4	24.1	-0.2	0.8	1.0	-0.7
FEB 96	28.6	0.3	27.6	-0.4	25.7	-0.5	26.0	0.3	0.1	-0.2	-0.5
MAR 96	28.8	0.4	27.8	-0.3	26.7	-0.2	25.9	0.0	0.7	1.0	-0.3
APR 96	29.3	0.5	28.1	-0.1	26.7	-0.4	24.1	-1.0	0.8	0.5	-0.5
MAY 96	29.6	0.5	28.5	0.0	26.2	-0.4	22.9	-1.0	0.3	1.2	1.2
JUN 96	29.7	0.4	28.6	0.1	25.7	-0.4	21.5	-1.2	1.4	1.6	-0.2
JUL 96	29.8	0.6	28.4	-0.1	25.1	-0.1	20.4	-1.2	0.7	0.6	-0.6
AUG 96	29.6	0.5	28.4	0.0	24.3	-0.3	20.5	-0.1	0.4	0.4	-0.3
SEP 96	29.8	0.6	28.4	0.1	24.3	-0.3	19.8	-0.5	0.5	-0.7	-1.7
OCT 96	29.9	0.6	28.5	0.1	24.3	-0.3	20.4	-0.3	0.4	-0.1	-0.8
NOV 96	29.5	0.3	28.2	-0.2	24.3	-0.3	20.5	-1.0	-0.0	-0.5	-0.5
DEC 96	29.2	0.3	28.3	0.1	24.1	-0.8	21.8	-0.8	0.8	-0.3	-1.9
JAN 97	28.6	0.1	28.3	0.3	24.7	-0.7	23.4	-0.9	0.3	1.7	0.9
FEB 97	28.5	0.2	28.2	0.2	25.9	-0.3	25.9	0.2	1.2	1.0	-1.9
MAR 97	28.3	-0.1	28.4	0.3	27.0	0.1	27.1	1.2	-0.6	-0.5	0.9
APR 97	29.0	0.2	29.1	0.9	27.5	0.4	26.3	1.2	-1.1	0.4	2.3
MAY 97	29.5	0.4	29.4	0.9	27.9	1.3	26.5	2.6	-2.5	-2.1	0.9
JUN 97	29.6	0.3	29.3	0.8	28.1	2.0	25.7	3.0	-2.3	-0.8	2.1
JUL 97	29.5	0.3	29.4	0.9	27.8	2.6	25.5	3.9	-0.8	-0.1	1.2
AUG 97	29.0	-0.1	29.2	0.8	27.7	3.1	24.0	3.4	-2.0	-0.9	2.2
SEP 97	29.0	-0.2	29.4	1.1	27.5	2.9	24.2	3.9	-1.4	0.1	2.7
OCT 97	29.6	0.3	29.1	0.7	27.9	3.3	24.8	4.1	-1.6	-0.2	2.7
NOV 97	29.5	0.3	29.3	0.9	28.2	3.6	25.4	3.9	-1.2	0.4	2.7
DEC 97	29.1	0.2	29.2	1.0	28.3	3.4	27.1	4.5	-0.9	-0.5	1.1
JAN 98	28.3	-0.2	29.0	1.0	28.4	3.0	28.0	3.7	-2.3	-3.6	1.4
FEB 98	28.1	-0.2	28.8	0.8	28.8	2.6	28.8	3.1	-1.8	-0.9	3.5
MAR 98	28.3	-0.1	28.6	0.5	29.0	2.1	28.8	2.9	-2.5	-2.8	2.3
APR 98	28.8	0.0	28.5	0.3	28.9	1.8	28.5	3.4	-2.3	-1.5	1.4
MAY 98	29.3	0.2	28.7	0.2	28.3	1.7	27.6	3.7	0.0	0.4	0.5

第1表　エルニーニョ監視指数

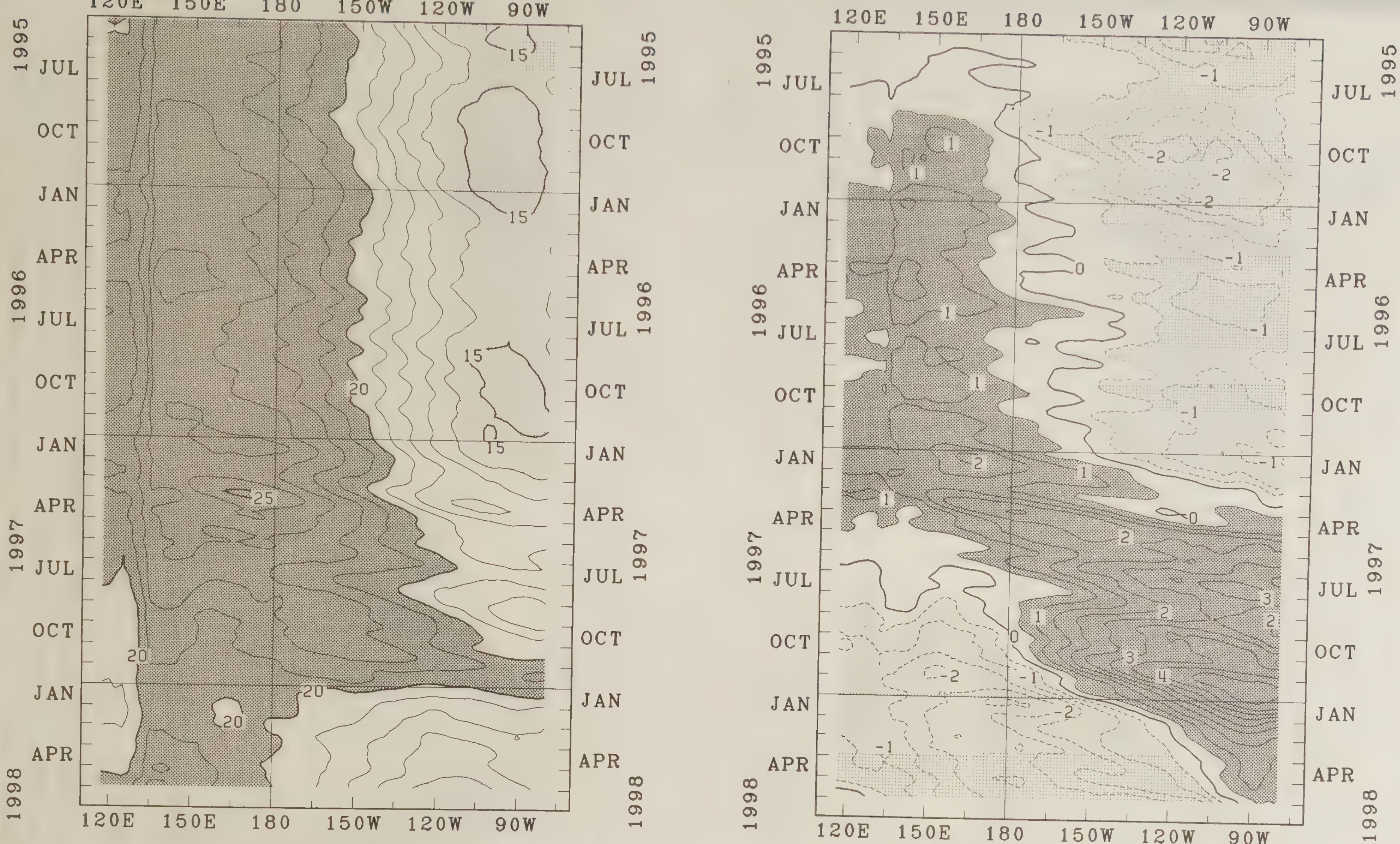
Table 1 El Nino Monitoring indices



第 25 図　赤道に沿った海面水温（左）および偏差（右）の時間-経度断面図

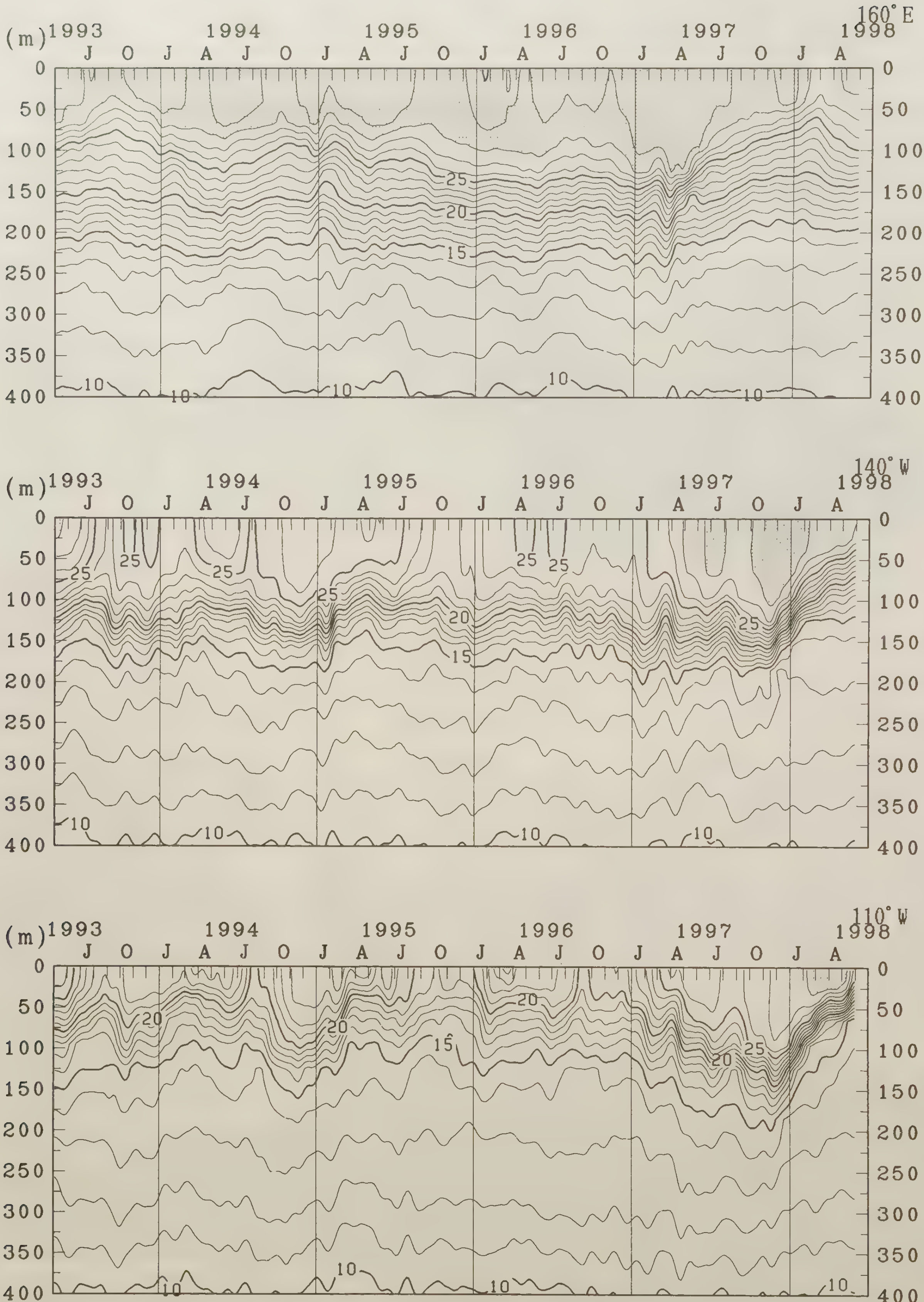
Fig.25　Time-longitude sections of SSTs (left) and anomalies (right) along the equator (2 °N-2 °S) in the global ocean. Contour interval is 1 °C (left) and 0.5 °C (right). Values greater than 28 °C are shaded and values less than 23 °C are spotted in the left panel. Dashed contours indicate negative anomalies in the right panel. Anomalies are computed from 1961-1990 base period means.

Time-Longitude Sections of Ocean Heat Content & Anomalies (Eq.)



第26図　太平洋の赤道に沿う海洋表層の貯熱量（左）及び偏差（右）の時間－経度断面図

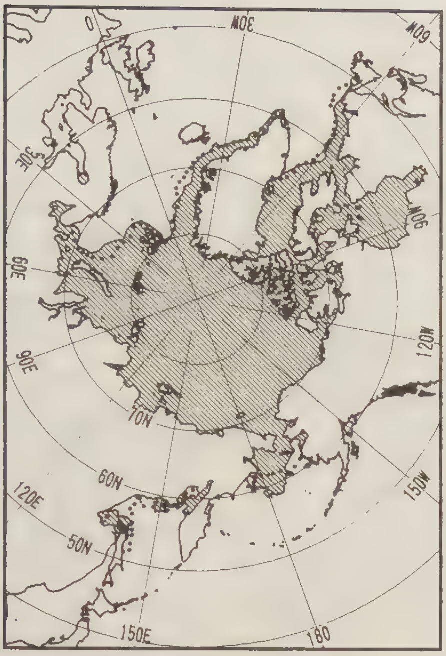
Fig.26 Time-longitude sections of ocean heat content in the upper 260m along the equator (left) and anomalies (right) in the Pacific Ocean. Data are derived from the Ocean Data Assimilation System of JMA. Contour interval is 1°C (left) and 0.5°C (right). Values greater than 20°C are shaded and values less than 16°C are spotted in the left panel. Dashed contours indicate negative anomalies in the right panel. Anomalies are computed from 1987-1997 base period means.



第27図　太平洋赤道域の表層水温の時間－深度断面図

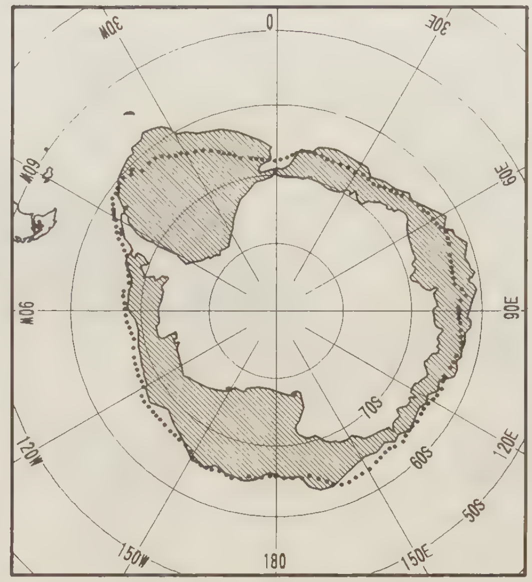
（上：西部、中：中部、下：東部）

Fig.27 Time-depth sections of equatorial subsurface temperature for the western Pacific (top, 160°E), the central Pacific (middle, 140°W) and the eastern Pacific (bottom, 110°W). Data are derived from the Ocean Data Assimilation System of JMA. Contour interval is 1°C. Values greater than 28°C are shaded.



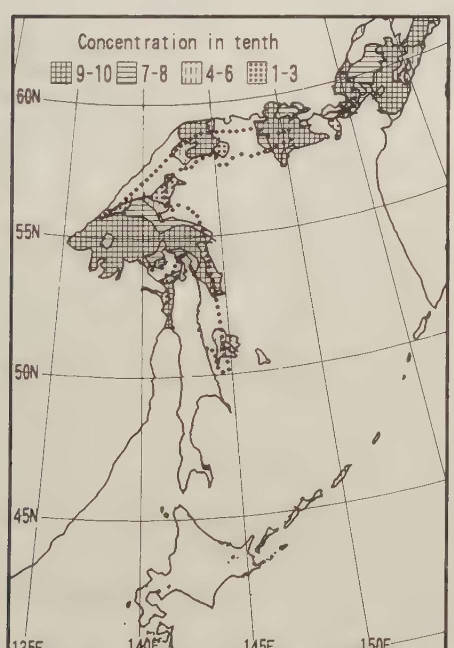
第28-1図 北極域の海氷図（1998年 5月22日）

Fig.28-1 Sea ice chart in the Arctic on 22 May 1998.
The shaded area represents the sea ice extent. The dotted line denotes the mean ice edge averaged for the period from 1972 through 1990.
The data source is the National Ice Center (USA).



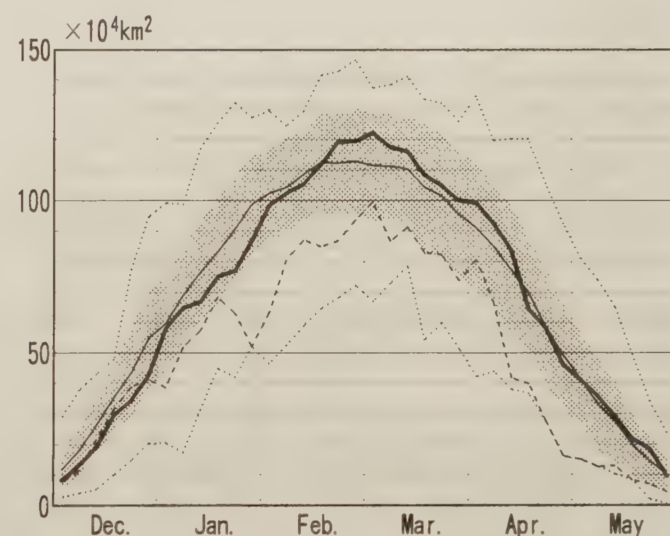
第28-2図 南極域の海氷図（1998年 5月17日）

Fig.28-2 Sea ice chart in the Antarctic on 17 May 1998.
The shaded area represents the sea ice extent. The dotted line denotes the mean ice edge averaged for the period from 1973 through 1990.
The data source is the National Ice Center (USA).



第28-3図 オホーツク海の海氷図（1998年 5月15日）

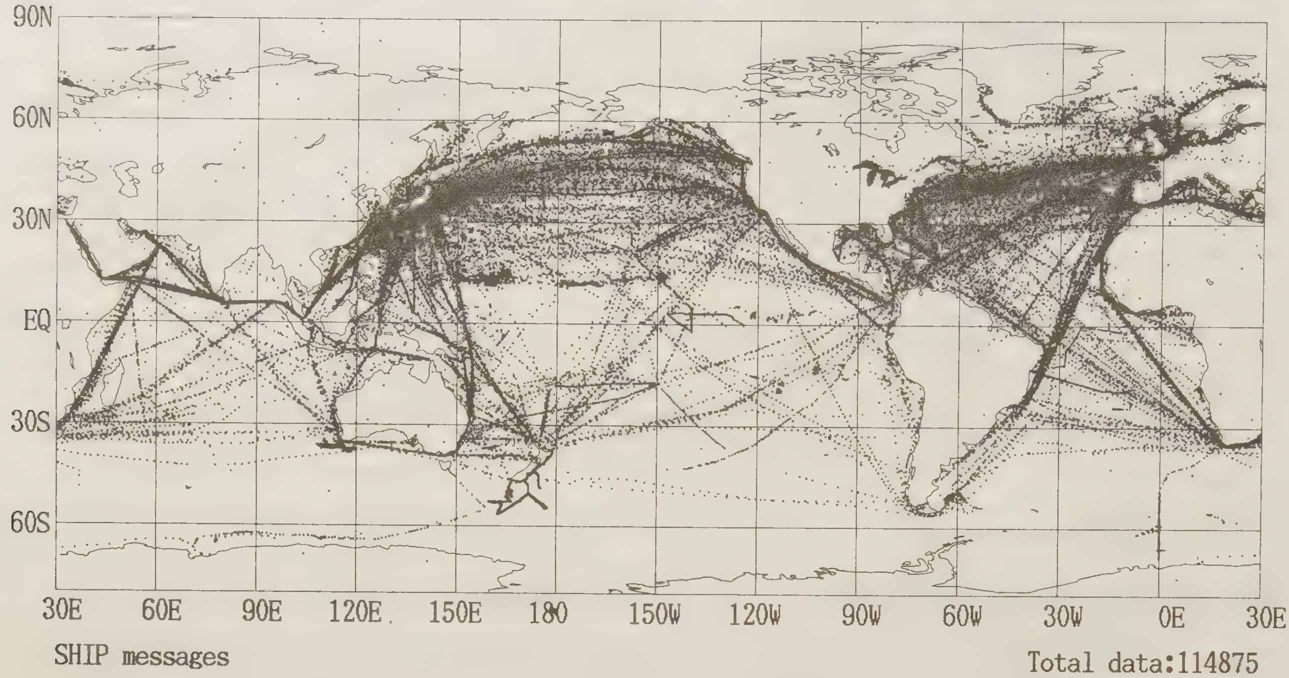
Fig.28-3 Sea ice chart in the Sea of Okhotsk on 15 May 1998.
The dotted line denotes the mean ice edge averaged for the period from 1971 through 1990.

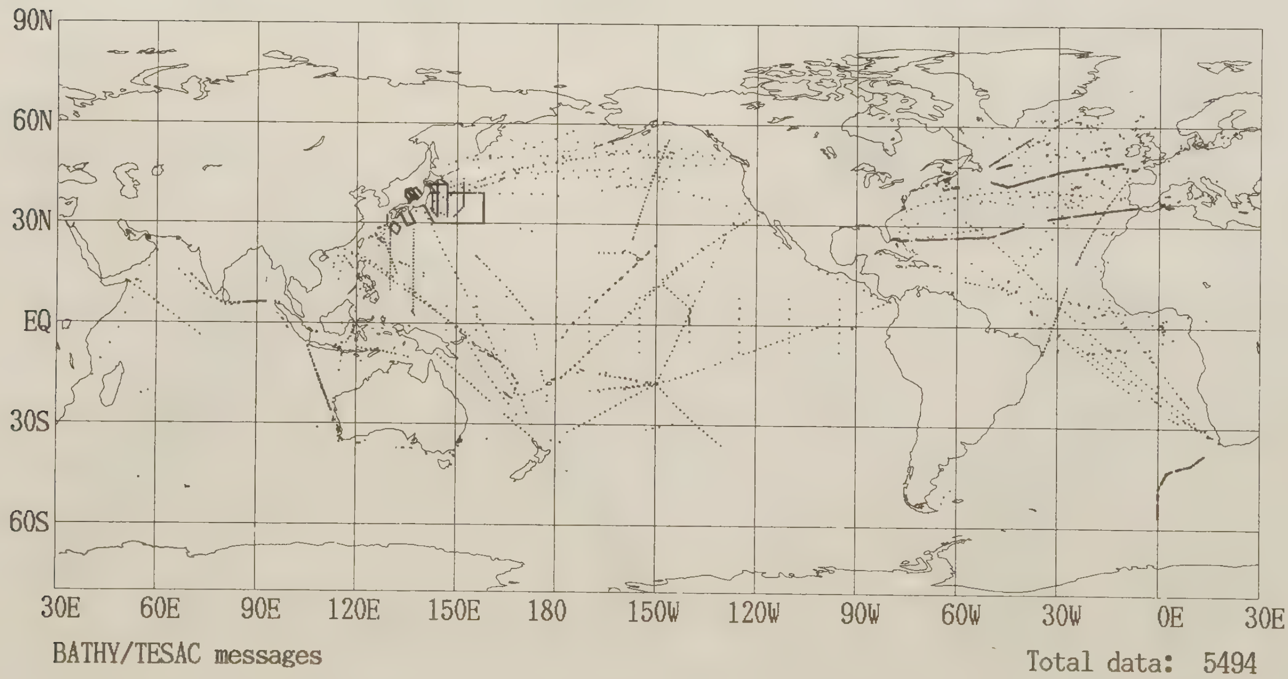


第28-4図 オホーツク海の海氷域面積（1997-1998）

Fig.28-4 Time-series of 5-day sea ice extent in the Sea of Okhotsk (1997–1998).

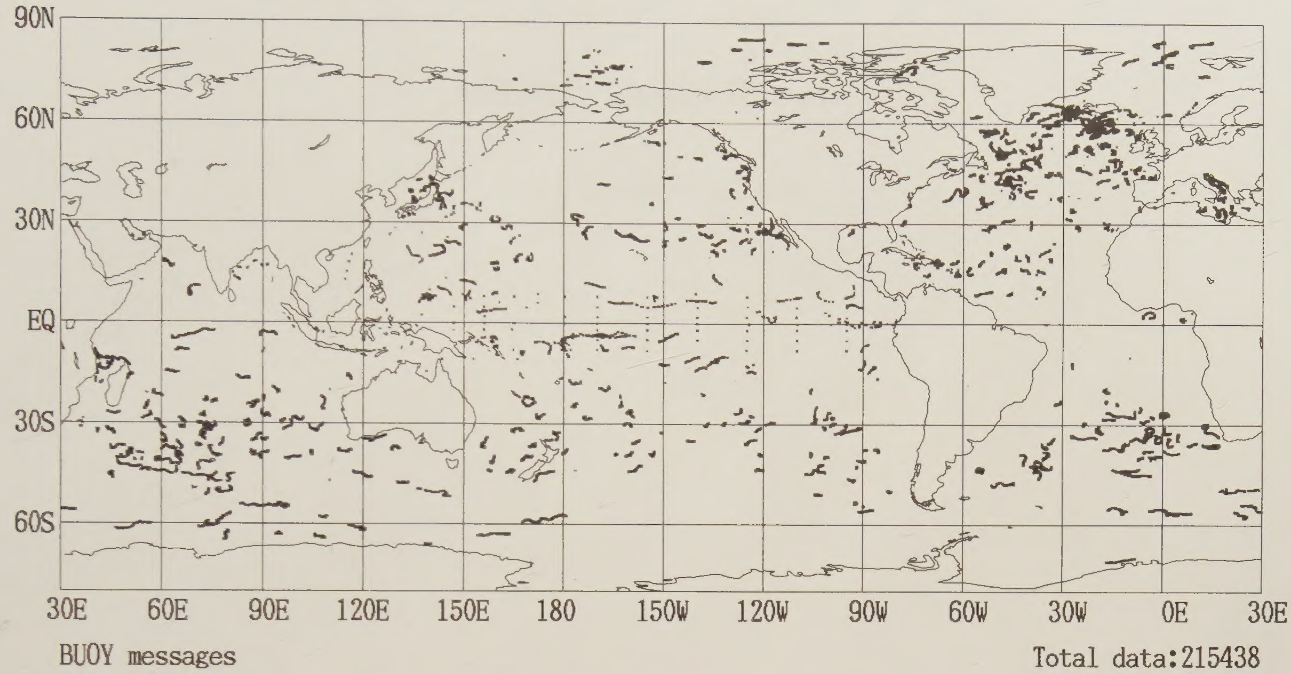
- (thick solid line) : current season (1997/98)
- (thin solid line) : mean extent (1971–1990)
- (dotted line) : maximum or minimum extent (1971–1997)
- (dashed line) : last season (1996/97)
- (shaded) : mean $\pm 1\sigma$ (1971–1990)

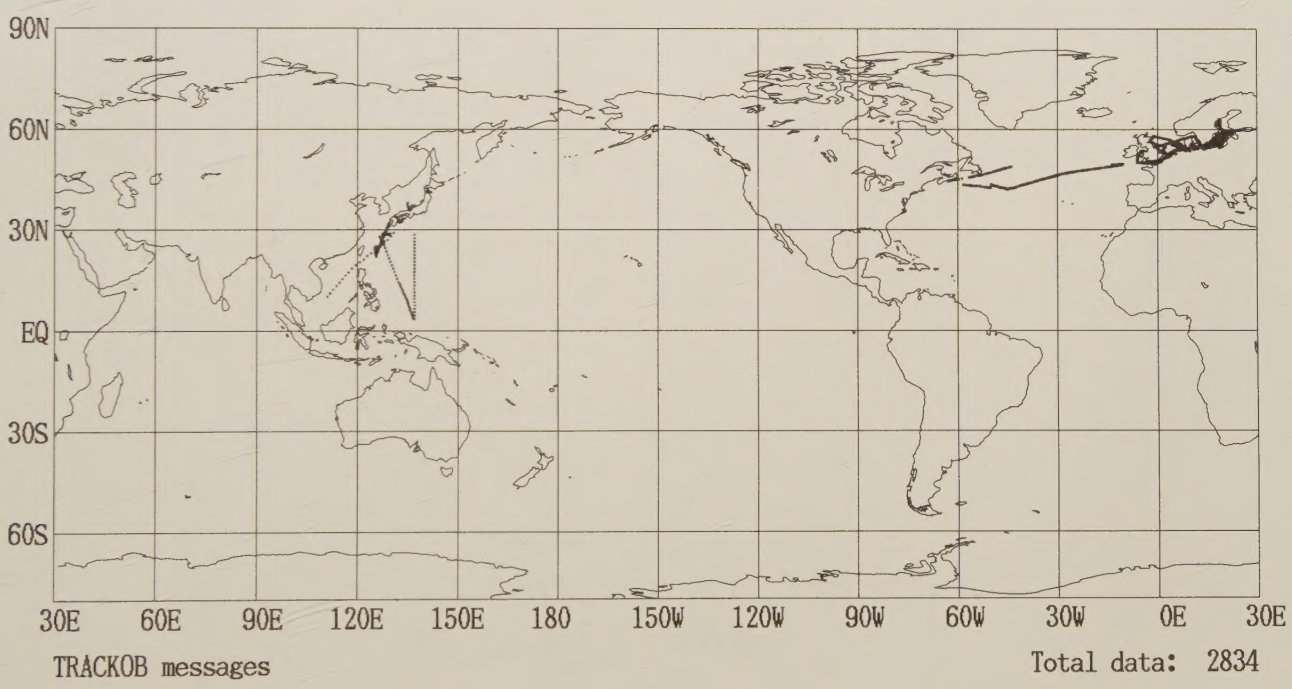




第29-1図　測点分布図(1998年 5月)

Fig.29-1 Geographical distribution of SHIP messages (SST data, top) and BATHY/TESAC messages (subsurface temperature data, bottom) for MAY 1998.





第29-2図　測点分布図(1998年 5月)

Fig.29-2 Geographical distribution of BUOY messages (buoy drift and SST data, top) and TRACKOB messages (ship drift and SST data, bottom) for MAY 1998.

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